Tactical Tomahawk Weapon Control System (TTWCS)

Description
TTWCS is the next significant upgrade to the current Advanced Tomahawk Weapon Control System (ATWCS). TTWCS initializes, prepares and launches Block III and Block IV Tomahawk Land Attack missiles. TTWCS also introduces the ability for firing units to plan Block III and Block IV GPS-only missions, retarget Block IV missiles to alternate pre-planned targets, and monitor missiles in-flight. The upgraded system reduces the number of equipment racks required aboard surface ships, introduces common software for the various Tomahawk capable platforms (DDG, CG, SSN, SSGN, and U.K. SSN) and reduces overall reaction and engagement planning timelines. TTWCS also improves operator interaction with the system and provides an integrated training capability at all levels. Furthermore, TTWCS builds upon the ATWCS system architecture to maintain existing Tomahawk Weapon System (TWS) Baseline III functionality, provides for future growth, and enhances command-and-control interoperability.

Status
The TTWCS Block III weapon control system capability reached IOC in 2003. Full Block IV IOC occurred in 2004 with the introduction of the Tactical Tomahawk Block IV missile. The USS *Stetham* (DDG 63) launched a Block III and several Block IV Tomahawk missiles using the new TTWCS Version 4, successfully testing Launch Platform Mission Planning (LPMP) and other Baseline IV TWS capabilities. TTWCS Version 5 continues to enhance the TTWCS capabilities with a scheduled IOC in third quarter 2007. SSGNs will also be outfitted with TTWCS scheduled IOC in 2007. TTWCS functionality is also currently planned for installation on the DDG 1000 combatant.

Developers
Naval Surface Warfare Center, Dahlgren; Dahlgren, Virginia
Lockheed Martin; Valley Forge, Pennsylvania
Naval Undersea Warfare Center, Keyport; Keyport, Washington
Southeastern Computers Consultants Inc.; Austin, Texas
Naval Undersea Warfare Center; Newport, Rhode Island

SEA SHIELD

PLATFORMS

Aircraft

Broad Area Maritime Surveillance (BAMS) Unmanned Aircraft System (UAS)

Description
BAMS UAS is integral in recapitalizing the Navy's airborne ISR force. BAMS UAS will provide a persistent maritime ISR capability that will play a significant role in the Sea Shield and FORCENet pillars of *Sea Power 21*. In its Sea Shield role, BAMS UASs on-station persistence enables unmatched awareness of the maritime battlespace by sustaining the maritime Common Operational Picture for Surface Warfare and the Global War on Terrorism. The system will serve as a Fleet Response Plan enabler while acting as a trip wire for surge forces. In its FORCENet role, it will support decision superiority precision and mobility while providing IP-based wideband transponder services that net the battlespace.

BAMS UAS is an endurance-class UAS that will operate from land-based sites around the world. Sites most likely will be located at current P-3 aircraft, or its planned successor, MMA, operating sites. Because BAMS UAS and the MMA/P-3 have related, complementary missions, co-location enhances manpower, training, and maintenance efficiencies. Systems of up to 5-6 air vehicles at each operating location provide persistence by being airborne 24 hours a day, 7 days a week out to on-station ranges of 2,000 nautical miles. Worldwide access is achieved by providing coverage over high-density sea-lanes, littorals, and areas of national interest from its operating locations.

Status
The BAMS UAS analysis of alternatives, operational requirements document, and initial CONOPS is complete. Milestone B is scheduled for fourth quarter FY 2007 and IOC is scheduled for FY 2014.

Developers
To be determined.

MH-60R/S Seahawk Multi-Mission Combat Helicopters

Description
The MH-60R and MH-60S multi-mission combat helicopters are the two pillars of the CNO's Naval Helicopter Concept of Operations (CONOPS) for the 21st Century. Under the Helicopter CONOPS, the Seahawk will deploy as companion squadrons embarked in the Navy's aircraft carriers, surface warships, and logistics ships. The MH-60R will provide surface and undersea warfare support to Sea Shield operations with a suite of sensors and weapons that include low frequency (dipping) sonar, electronic support measures, advanced Forward Looking Infrared, and precision air-to-surface missiles. The MH-60S will provide mine warfare support for Sea Shield and will partner with the MH-60R for surface warfare missions carrying the same Forward Looking Infrared air-to-ground sensors and weapons. The MH-60S will be reconfigurable to provide Combat Search and Rescue

and Naval Special Warfare support to joint theater operations. Airborne mine countermeasures operations will be accomplished using advanced sensor and weapons packages to provide detection, localization, and neutralization to anti-access threats. The MH-60S will anchor the fleet logistics role in carrier strike group and expeditionary strike group operations. MH-60R/S platforms are produced with 85 percent common components (e.g., common cockpit and dynamic components) to simplify maintenance, logistics, and training.

Status
The MH-60R completed its OPEVAL in third quarter FY 2005. It was authorized to enter full-rate production in March 2006. The Navy plans to acquire 254 MH-60Rs. The MH-60S was approved for full-rate production in August 2002 and is currently undergoing scheduled block upgrades for combat and airborne mine counter-measure missions. The Navy plans to acquire 271 MH-60Ss.

Developers
Lockheed Martin; Owego, New York
Sikorsky; Stratford, Connecticut

MQ-8B Fire Scout Vertical Takeoff and Landing Tactical UAV (VTUAV)

Description
Fire Scout VTUAV will provide multi-mission tactical UAS support to the Littoral Combat Ship (LCS). Fire Scout will support LCS core mission areas of Mine Interdiction Warfare (MIW), Antisubmarine Warfare (ASW), and Surface Warfare (SUW) with modular payloads as well as organic ISR, targeting, and communication-relay functions. The Fire Scout will employ the Tactical Control System (TCS) and the Tactical Common Data Link (TCDL) as the primary means for UAS command and control and sensor payload dissemination. Fire Scout is a critical component of LCS off-board sensors.

Status
Fire Scout is currently in Engineering, Manufacturing, and Development (EMD) with developmental testing ongoing. Fire Scout is scheduled for IOC in FY 2008. Fire Scout has also been selected by the U.S. Army for its Future Combat Systems (FCS) Class IV Unmanned Aircraft System.

Developers
Northrop Grumman; San Diego, California
Schweizer Aircraft Corporation; Big Flats, New York

P-3C Orion Modification, Improvement, and Sustainment

Description

The P-3C Orion provides effective undersea warfare, anti-surface warfare, and Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) capabilities to naval and joint commanders, including support for carrier strike groups and expeditionary strike groups. The current force is 12 active and three reserve squadrons. There are also three Reserve Fleet Response Units (FRUs) co-located with the active squadrons at Jacksonville, Florida; Brunswick, Maine, and Whidbey Island, Washington. The FRUs operate current Fleet equipment and are trained to provide augmenting crews to the active force. The Navy's P-3 roadmap focuses on three areas: Inventory sustainment, modernization, and re-capitalization by the Multi-Mission Maritime Aircraft (MMA) to provide a force optimized for regional and littoral crisis and conflict.

Specific program elements include:

Inventory Sustainment: A service life assessment program has been completed to determine what actions must be taken to safely extend the airframe service life. A program of Special Structural Inspections (SSIs), which will allow extension of P-3 service life, started in FY 2003. More comprehensive inspections and preemptive repairs are being performed under the Enhanced Special Structural Inspection (ESSI) program that started in FY 2004. The Special Structural Inspection-Kit (SSI-K) program that began in FY 2005 is similar to ESSI but has expanded scope and includes use of new design/materials to increase fail-safe margins. These programs will allow sustainment of the P-3 fleet until the MMA starts replacing the P-3 in 2013.

Modernization: The Anti-Aircraft Improvement Program (AIP) provides enhanced sensor, C4ISR, and weapon capabilities. The program includes the incorporation of improved C4I systems, an advanced imaging radar, an infrared/electro-optic sensor, an improved Electronic Support Measures (ESM) system, improved weapons capability, and enhanced survivability measures. AIP aircraft will be equipped with the USQ-78B acoustic processor for improved littoral ASW effectiveness.

The P-3C Update III Block Modification Upgrade Program (BMUP) converts P-3C Update II and II.5 aircraft to the Update III system architecture. BMUP aircraft are also equipped with the USQ-78B.

Status

As of FY 2007, 77 SSIs are complete and 28 ESSIs are complete. Sixty-nine of 72 funded AIP aircraft have been delivered (one has been struck). Twenty-five BMUP aircraft have been delivered. Five

SSI-Ks are in production.

Developers
Lockheed Martin; Marietta, Georgia; Eagan, Minnesota; Greenville, South Carolina; Manassas, Virginia
L3Com; Greenville, Texas

P-8A Multi-mission Maritime Aircraft (MMA)

Description
The P-8A will replace the P-3C Orion aircraft, which has reached the end of its service life. The P-8A will feature a technologically agile, open architecture that enables integration of modern, capable sensors with robust communications. P-8A will tailor integration of its onboard mission suite with unmanned aerial vehicles and satellite-based systems and sensors to assure maritime access in support of the Sea Shield pillar of *Sea Power 21*. MMA will provide unparalleled persistent undersea warfare capability as well as significant anti-surface warfare and intelligence, surveillance, and reconnaissance (ISR) capability. MMA will leverage global logistics support infrastructure and established advanced training applications to provide both higher availability and improved warfighting readiness. Finally, MMA will implement a new Human Total Force Strategy that uses contractors to perform most of the maintenance functions presently performed by Sailors, thereby lowering operating and support costs below that of the legacy platform.

Status
The MMA program received a Milestone 0 decision in March 2000 and explored concepts for MMA with industry. Included in the concepts was the integration of UAVs to augment MMA capability. AoA began in summer 2000 and leveraged previous analyses and the results of the industry studies. This analysis concluded that manned aircraft are an essential element of providing broad area maritime and littoral armed ISR, and that UAVs provided a transformational opportunity for obtaining additional capability for warfighters. In 2002, the Navy re-engaged industry in Component Advanced Development, refining concepts, matching architecture to fill the Navy vision and validating requirements. USD (AT&L) approved a revised acquisition strategy to focus MMA on P-3 replacement, not a P-3 Service Life Extension. MMA reached Milestone B in May 2004 and the Navy selected the McDonnell-Douglas Corporation, a wholly owned Subsidary of the Boeing Company, as the single system integrator in June 2004. The P-8A program completed a successful Preliminary Design Review in November 2005 and is currently working toward Critical Design Review planned for early 2007.

Developers
The Boeing Company; Renton, Washington

S-3B Viking Sustainment Program

Description
The S-3B Viking provides multi-mission support to battle group and joint commanders as the carrier strike group's primary anti-surface warfare platform. In addition, it provides electronic surveillance and overland strike support and will remain the sole organic aerial refueling asset until the full integration of the F-18E/F Super Hornet. On 25 May 2006 NAVAIR delivered the first LANTIRN/ROVER Data Transmission System equipped S-3B to CVW-1. Total time to develop, test and deliver the aircraft took approximately ten weeks. Most of the major components came from existing NAVICP inventories. The S-3B will be utilized in a non-traditional ISR role providing a third generation FLIR capability and a means to transmit real time imagery to troops on the ground. LANTIRN development of follow-on aircraft will support the remaining S-3B deployments.

Status
The S-3B Viking community was selected for retirement in October 2002, which will be coordinated with the fielding of the F/A-18E/F Super Hornet tanker capable aircraft through FY 2009. All current avionics/navigation/computer upgrade programs required to safely sustain the aircraft through its projected retirement schedule have been completed.

Developers
Lockheed Martin; Fort Worth, Texas

Submarines

SSGN Nuclear-Powered Guided-Missile Submarine

Description
The first four of the *Ohio* (SSBN 726)-class Trident fleet ballistic missile submarines (SSBNs) are being converted to nuclear-powered guided missile and special-operations submarines (SSGNs). The SSGN configuration will be able to carry up to 154 Tomahawk (TLAM/TACTOM) land-attack missiles to conduct covert, large-volume, precision strikes. With unparalleled on station persistence and unrivaled access, the SSGN will prepare the knowledge battlespace for follow-on forces using a variety of on-board and off-board sensors such as Unmanned Underwater Vehicles (UUV) and one of the most advanced sonar and fire control systems ever fielded on a submarine. The *Ohio*-class SSGN will also have the capability to support a Special Operations Force (SOF) contingent of up to 66 personnel for an extended period of time, providing clandestine insertion and retrieval via converted missile tubes used as lockout chambers, dry deck shelters, or the Advanced SEAL Delivery System (ASDS). Operating with two crews and using the existing Trident infrastructure, this potent warfighter is designed

to have a 70 percent in-theater presence. With the large payload capability of an SSBN and the flexibility of having 22 seven-foot diameter reconfigurable converted missile tubes, these transformational submarines will have the ability to leverage future payloads and sensors, including potential use a platform for ballistic missile defense. All of this combines to make the SSGN the platform of choice for a wide variety of missions both now and into the foreseeable future.

Status

The first two ships, the USS *Ohio* (SSBN 726) and USS *Florida* (SSBN 728), began their refueling and conversion overhauls in FY 2003. The USS *Michigan* (SSBN 727) and USS *Georgia* (SSBN 729) began their refueling and conversion overhauls in FY 2004 and FY 2005, respectively. The USS *Ohio* delivered to the Navy at the end of 2005 and USS *Florida* delivered to the Navy in the spring of 2006. USS *Michigan* delivered to the Navy in November 2006. The first SSGN will be deployment ready in FY 2007. The anticipated cost for all four SSGN conversions is approximately $4 billion.

Developers

General Dynamics Electric Boat; Groton, Connecticut

SSN 774 *Virginia*-Class Nuclear-Powered Attack Submarine

Description

The transformational USS *Virginia* (SSN 774)-class submarine provides advanced acoustic technology and performs traditional open-ocean anti-submarine and anti-surface missions, yet is specifically designed for multi-mission littoral and regional operations. These advanced submarines are fully configured to conduct mining and mine reconnaissance, Special Operations Forces (SOF) insertion/extraction, battle group support, intelligence-collection and surveillance missions, sea-control, and land attack. Furthermore, the *Virginia* SSNs is specifically configured to adapt easily to special missions and emerging requirements. The 30-ship SSN 774 program is the first major program to fully implement acquisition reform initiatives. The tenets of the *Virginia*-class affordability are Integrated Product and Process Development (IPPD), modular construction, parts reduction, and aggressive insertion of advanced COTS technologies and an open-architecture computing environment. The IPPD concept teams the Navy, shipbuilders, designers, and vendors to assure the most efficient and effective design early in the design process. Modular construction allows construction, assembly, and testing of systems prior to installation in the ship's hull, thereby reducing costs, minimizing rework, and simplifying system integration. The ship's modular design

will also facilitate technology insertion in both new-construction future ships and back-fit into existing ships, throughout their 30-year service lives.

Status

The ships are being built under an innovative teaming arrangement between General Dynamics Electric Boat (EB) and Northrop Grumman Newport News (NGNN). EB will assemble and deliver the first, third, and fifth ships; NGNN, the second, fourth, and sixth. Construction of the USS *Virginia* (SSN 774) began in FY1998, and the ship was commissioned in October 2004. The *Virginia* conducted her first operational mission in 2005, prior to her Post Shakedown Availability dry-docking, an unprecedented achievement. *Virginia's* ability to successfully complete this early deployment is a testament to the excellent design and construction effort put forth by both EB and NGNN. USS *Texas* (SSN 775) began construction in FY 1999 and was commissioned in September 2006. USS *Hawaii* (SSN 776) began construction in FY 2001. USS *North Carolina* (SSN 777) began construction in FY 2002. USS *New Hampshire* (SSN 778) began construction in FY 2003. USS *New Mexico* (SSN 779) began construction in FY 2004 and SSN 780, SSN 781, and SSN 782 began construction in FY 2005, FY 2006, and FY 2007, respectively. *Virginia*-class acquisition continues throughout the FYDP. The FY 2007 request included funds for the fourth of five submarines ordered under an innovative multi-year procurement contract that resulted in a cost savings of approximately $80 million per hull or $400 million throughout the course of the contract.

Developers

General Dynamics Electric Boat Corporation;
Groton, Connecticut
Northrop Grumman; Newport News, Virginia

Surface and Expeditionary Warfare Ships and Craft

CG 47 *Ticonderoga*-Class Aegis Guided-Missile Cruiser Modernization

Description

The 22 *Ticonderoga* (CG 47)-class guided missile cruisers have a combat system centered on the Aegis Weapon System and the SPY-1 A/B multi-function, phased-array radar. *Ticonderoga*-class cruisers provide multi-mission offensive and defensive capabilities, and operate independently or as part of carrier strike groups, expeditionary strike groups, and surface action groups in support of global operations. The *Ticonderoga*-class combat system includes the Standard Missile (SM-2), unparalleled land-attack systems, advanced anti-submarine and anti-surface warfare systems,

embarked sea-control helicopters, and robust command-control-and-communications systems in a potent, multi-mission warship. In addition, these cruisers are equipped with the MK-41 Vertical Launching System (VLS), giving them a significant surface fire capability with the Tomahawk Land-Attack cruise Missile (TLAM) and, in the future, the Tactical Tomahawk (TACTOM).

Status
The 22 VLS-capable Aegis cruisers are planned for Cruiser Modernization beginning in FY 2008, and will receive upgrades in air dominance (cooperative engagement capability, SPY radar upgrades), maritime force protection (CIWS 1B, ESSM, Nulka, SPQ 9B), undersea warfare (SQQ 89A(V)15) and mission life extension (SmartShip, all-electric auxiliaries, weight, and moment). The cruisers are viable candidates for a ballistic missile defense role. The Cruiser Modernization warfighting improvements will extend the Aegis combat system's capabilities against projected threats well into the 21st Century and, with the DDG 51 destroyers, serve as the bridge to the surface combatant family of ships: DDG 1000, LCS, and CG(X).

Developers
General Dynamics Bath Iron Works; Bath, Maine
Northrop Grumman Ship Systems; Pascagoula, Mississippi
Lockheed Martin; Moorestown, New Jersey

CG(X) 21st Century Cruiser

Description
The Next-Generation Guided Missile Cruiser, CG(X), is envisioned as a highly capable surface combatant tailored for Air and Missile Defense and Joint Air Control Operations. CG(X) will provide maritime dominance, independent command and control, forward presence and operate as an integral component of joint and combined forces. The CG(X) design and development program features evolutionary acquisition and spiral development practices to incorporate advanced technologies and next generation engineering systems. CG(X) will also replace the *Ticonderoga* (CG 47)-class ship at the end of its 35 year service life. Current Navy campaign and joint missile defense analysis has demonstrated a critical mission need for CG(X) late next decade.

Status
The JROC validated the Maritime Air and Missile Defense of the Joint Forces Initial Capabilities Documenting 2006. The Navy was designated as the lead service for Concept Refinement Phase of acquisition and is leading the AoA to determine CG(X)'s best mix of capabilities and tradeoffs between hull form, interceptors, air and missile defense systems, sensors, other combat systems, employment and costs.

Developers
To be determined.

DDG 51 *Arleigh Burke*-Class Aegis Guided-Missile Destroyer Modernization

Description
The *Arleigh Burke* (DDG 51)-class guided missile destroyers will undergo a mid-life modernization commencing in FY 2010 with DDG 51. The program will be accomplished in two phases. The first phase will concentrate on the Hull, Mechanical, and Electrical systems to include new Giga Bit Ethernet connectivity in the engineering plant, a Digital Video Surveillance System, along with the Integrated Bridge, an Advanced Galley and other habitability and manpower reduction modifications. A complete Open Architecture computing environment will be the foundation for war fighting improvements in the second phase for each ship. The upgrade plan consists of an improved Multi-Mission Signal processor to accommodate Ballistic Missile Defense capability and an improvement to radar performance in the littoral regions. IABM and NIFC-CA bring joint capability to the war fighter resident in the new superset computer program. Additionally, Cooperative Engagement Capability (CEC), Evolved Sea Sparrow Missile (ESSM), CIWS Blk 1B, SEWIP, and NULKA. The *Burke*-class MK-41 Vertical Launching System (VLS) will be upgraded to support SM-3 and newer variants of the SM missile family. DDG 51 destroyers will continue to provide multi-mission offensive and defensive capabilities with the added benefit of Sea-based protection from the ballistic missile threat. These two phases will be accomplished on each ship approximately two years apart. Together with the Cruiser Modernization program, these highly capable warships will be the bridge to the next-generation surface combatant family of ships: DDG 1000, LCS, and CG(X).

Status
The Hull, Mechanical, and Electrical modifications are being designed in the last two new construction *Arleigh Burke*-class destroyers (DDGs 111-112). This design in new construction maximizes risk reduction and proofs these alterations in the builder's yards. The authorization and appropriation for the last three DDGs, to complete a ship class of 62, was completed in 2005. DDG Modernization concentrates initially on the Flight I and II ships (hulls 51-78). However, this program is a modernization program for the entire 62 ship class.

Developers
General Dynamics Bath Iron Works; Bath, Maine
Northrop Grumman Ship Systems; Pascagoula, Mississippi
Lockheed Martin; Moorestown, New Jersey

DDG 1000 21st Century Destroyer

Description

The DDG 1000 is the Navy's future multi-mission destroyer, designed to provide precision strike and sustained volume fires to support Joint forces inland and conduct independent attacks against land targets. DDG 1000 will be armed with the Advanced Gun System (AGS), which fires precision-guided Long-Range Land-Attack Projectiles (LRLAP) up to 83 nautical miles. For longer-range strike missions, DDG 1000 will carry Tactical Tomahawks (TACTOM) housed in a damage-tolerant Peripheral Vertical Launch System (PVLS) lining the ship's hull. With state-of-the-art network-centric information technologies, DDG 1000 will operate seamlessly with naval, ground, and land-based forces. The DDG 1000 program's emphasis on "sensor-to-shooter" connectivity will provide a naval or Joint Task Force commander with the multi-mission flexibility to engage a wide variety of land targets while simultaneously defeating maritime threats. DDG 1000 capabilities in undersea, surface, and air warfare are designed for enhanced performance in the littoral environment, providing defense of other ships in the expeditionary strike group or carrier strike group. DDG 1000 will have a flight deck that can support unmanned aerial vehicles as well as helicopters and the new MV-22 tilt rotor aircraft. DDG 1000 will utilize multi-spectral signature reduction to render it significantly less detectable to potential adversaries and more survivable than our legacy fleet. DDG 1000 will feature an Integrated Power System (IPS) to provide power for advanced propulsion systems as well as high-powered combat systems and ship service loads. An open-architecture distributed combat system will support a "plug-and-fight" environment. Current elements of the DDG 1000 combat system include the modular and highly survivable PVLS, the AGS and the Dual Band Radar (DBR) suite, composed of the Multi-Function and Volume Search Radars. Other DDG 1000 features include an advanced hull form, optimal manning based on comprehensive human-systems integration and human-factors engineering studies, extensive automation, advanced apertures, and dramatic reductions across the entire spectrum of signatures (radar, acoustic, magnetic, and infrared). DDG 1000 will use a "spiral-design" review process, ensuring that each of these breakthrough technologies responds to future operational requirements. Once validated aboard DDG 1000, appropriate technologies will be incorporated into other members of the family of surface combatants, including the next-generation cruiser as well as future carriers and amphibious ships.

Status

The DDG 1000 program successfully completed ten Engineering Development Models for new technologies and is ready to transition this technology into production. Recent Congressional support of the Navy's Dual Lead Ship acquisition strategy is allowing competing shipyards to build the two lead ships simultaneously.

The Navy expects to award construction contracts in early 2007. Currently the ship is in Detailed Design and the lead ships will deliver in 2012.

Developers
Northrop Grumman Ship Systems (NGSS); Pascagoula, Mississippi
General Dynamics Bath Iron Works; Bath, Maine
Raytheon Systems, Inc; Sudbury, Massachusetts
BAE Systems; Minneapolis, Minnesota
More than 80 companies nationwide, including Lockheed Martin, involved with DDG 1000.

FFG 7 *Oliver Hazard Perry*-Class Guided-Missile Frigate Modernization

Description
The *Oliver Hazard Perry* (FFG 7)-class guided-missile frigates are capable of operating as an integral part of a carrier strike group or surface action group. They are primarily used today to conduct maritime interception operations, presence missions and counter-drug operations. A total of 55 *Perry*-class ships were built—51 for the U.S. Navy and four for the Royal Australian Navy. Of the 51 ships built for the United States, 21 remain in active commissioned service and nine are in the Navy Reserve Force. The FFG modernization improvements will assist the class in reaching its 30-year expected service life.

Status
The 30-ship FFG class is undergoing a modernization package that commenced in FY 2003 with USS *Kauffman* (FFG 59). It corrects the most significant maintenance and obsolescence issues in order to maintain the ships through their full 30-year service lives. The FFG 7 modernization package includes replacement of four obsolete Ship Service Diesel Generators with COTS SSDGs; obsolete evaporators with COTS Reverse Osmosis (RO) units; and existing track way boat davit with COTS Slewing Arm Davit (SLAD). Other major HM&E alterations remaining include ventilation modifications and AMR #3 fire-fighting sprinkler modifications. The modernization effort's scheduled for completion by 2011.

Developers
General Dynamics Bath Iron Works; Bath; Maine

Littoral Combat Ship (LCS)

Description

Future joint and combined operations will hinge on our ability to provide access in the face of an unpredictable and asymmetrical threat. This has been recognized for some time; however, the events of the last few years, including the Global War on Terrorism, have brought a renewed sense of urgency to these missions. The anti-access threats challenging our naval forces in the littorals include quiet diesel submarines, mines, and small highly maneuverable surface attack craft. Such threats have great potential to be effectively employed by many less-capable countries and non state actors to prevent U.S. forces from unhindered use of littoral areas. LCS, as one element of the future surface combatant family of ships, will be optimized to defeat these anti-access threats in the littoral. It will use open-systems architecture design, modular weapons and sensor systems, and a variety of manned and unmanned vehicles to expand the battle space and project offensive power into the littoral. Technology has matured to the point where we can employ significant warfighting capability from a small, focused-mission warship like the LCS in support of Sea Strike and Sea Shield operations. Focused-mission LCS mission packages are being developed that will provide capabilities critical to Sea Shield's forcible entry, sea/littoral superiority, and homeland defense missions. The ship will also possess inherent capabilities to conduct missions supporting ISR, special operations, and maritime interception and homeland defense, regardless of mission package installed. Fully self-deployable and capable of sustained underway operations from homeports to any part of the world, the LCS will have the speed, endurance, and underway replenishment capabilities to transit and operate independently or with carrier strike or expeditionary strike groups.

Status

LCS will capitalize on emerging unmanned vehicle, sensor and weapons technologies and will deliver the focused Sea Shield missions of Mine Warfare, Surface Warfare, and Anti-Submarine Warfare. Initial program included four Flight 0 ships through FY 2007 Flight 0 will include all ships through FY 2009. In May 2004, Navy awarded two contracts options to Lockheed Martin and General Dynamics to build four LCS ships (2 of each design). USS Freedom (LCS 1), the first Lockheed Martin ship, is under construction in Marinette Marine (WI) with expected completion late 2007. USS Independence (LCS 2), the first General Dynamics ship, is under construction at Austal in Mobile, Alabama with an expected completion in early 2008. The Mine Warfare mission package will deliver in FY 2007 with Anti-submarine Warfare and Surface Warfare packages delivering in FY 2008.

Developers

Flight 0 teams led by General Dynamics and Lockheed Martin

MCM-1 *Avenger*-Class Mine Countermeasures Ship Modernization

Description
The *Avenger* (MCM-1)-class mine countermeasures ships are primarily used to detect, classify, neutralize, and sweep mines in sea lines of communication and operating areas. These ships are one part of the mine countermeasures triad. A total of 14 *Avenger*-class ships were built. Of the 14 ships built, nine remain in active service, and five are in the Navy Reserve Fleet pending return to active service by the end of FY 2009. The MCM modernization improvements will assist the class in reaching its 30-year expected service life.

Status
The 14-ship MCM class is undergoing a modernization package that commenced in FY 2004. It corrects the most significant maintenance and obsolescence issues in order to maintain the ships through their full 30-year service lives. The MCM-1 modernization package includes Planned Product Improvement Program (PPIP) on the Isotta Fraschini main engines and generators for MCM-3 through MCM-14; replacement of the obsolete Mine Neutralization Vehicle with Expendable Mine Neutralization System (EMNS); and upgrading the existing SQQ-32 Sonar with High Frequency Wide Band capabilities. Other major HM&E alterations include 400-Hz modifications, replacement of Aft Deck hydraulic equipment with electric equipment, replacement of the diesel generator analog voltage regulators with digital voltage regulators, and upgrading the common navigation system. The modernization effort is scheduled for completion by 2010.

Developers
USN FDGM; Ingleside, Texas
USN Raytheon; Portsmouth, Rhode Island

Equipment and Material

Chemical, Biological, Radiological and Nuclear Defense - Individual Protection Equipment - Readiness Improvement Program (CBRND - IPE - RIP)

Description
The Individual Protective Equipment (IPE) Readiness Improvement Program (RIP) for the Forces Afloat manages millions of individual pieces of equipment for Sailors deploying into potential CBR threat environments. Through a centralized management approach, this program ensures Sailors are always provided with correctly maintained and properly fitted individual protection ensembles and a chemical protective mask; ready for

immediate retrieval in response to the dictated Mission Oriented Protective Posture (MOPP) condition. Historically, the maintenance and logistics functions required to maintain the material readiness of this equipment required an extraordinary amount of organizational unit man hours that were better used supporting operational and training functions. The cornerstone of the RIP is the NAVSEA Consolidated Storage Facility (CSF) located at Ft. Worth, Texas. This NAVSEA managed facility executes the following key services:

• The inspection for serviceability of chemical protective equipment and mask

• Cleaning and sanitizing protective mask

• Testing of mask utilizing a mask leakage tester

• Laser etching protective masks with a bar-code serial number

• Assembly and disassembly of equipment

• Bar-coding of other IPE equipment/support equipment

• Packaging items for shipment

• Assembly of personalized and generic IPE kits

• Inventory management (bar-code warehouse management system)

• Shelf-life surveillance and maintenance

• Asset visibility for the annual reports to Congress.

Status

Over the past three years since the inception of the RIP program, more than 94,000 Sailors (approximately 75 percent of the Afloat Forces) have been processed through this program. Each of these Sailors were issued a personally sized and properly fitted Joint Service Lightweight Suit Technology (JSLIST) ensemble and a chemical protective mask. In addition to the IPE and gas masks, the Readiness Improvement Program currently provides support in other areas such as:

• Managing Interceptor Body Armor (IBA), Dorsal Auxiliary Protective Systems (DAPS) and Light Weight Helmets (LWH's) for the Expeditionary Forces

• Providing CBRND IPE and IBA to the Navy's Individual Augmentee's as they process through designated Army training centers and the management of CBRND IPE

• Managing Anti-Terrorism/Force Protection (AT/FP) equipment for the Military Sealift Command (MSC).

Developers
Naval Surface Warefare Center Panama City; Panama City, Florida
Battelle Memorial Institute; Columbus, Ohio
Gryphon Technologies; Riverdale, Maryland
General Dynamics Information Technology; Fairfax, Virginia

Shipboard Collective Protection System (CPS)

Description
CPS provides a protective environment from chemical, biological, and radiological (CBR) threats, where personnel can perform their mission-essential operations without the use of individual protective equipment. The system over-pressurizes specified ship spaces with air filtered through an array of housings, which contain multiple 200 cubic feet per minute CBR filter sets preventing the ingress of CBR contaminants. Zone ingress and egress through a variety of supporting systems including air locks, pressure locks, and decontamination stations located on the zone boundaries maintain the integrity of clean spaces. Integrated into the heating ventilation and air conditioning (HVAC) systems, shipboard CPS provides continuous protection to those personnel operating within the zone boundary. When it is not feasible to provide protection to the entire ship, mission-essential spaces such as medical spaces, command and control, and rest and relief areas are outfitted with CPS.

Status
Shipboard CPS is installed on more than 70 ships. CPS coverage varies by ship class and ranges from the entire ship interior (DDG 51 FLTI, DDG 51 FLTII, and AOE/T-AOE-6 class) to zone-specific coverage systems (DDG 51 FLTIIA, LSD, LPD 17, LHD, LHA, and LCS). These systems are a combination of new construction and back-fit installations, having unique requirements and support needs. Currently, it is projected that 127 ships will have CPS by FY 2013, increasing the total number of ships presently outfitted by over 75 percent.

Developers
Naval Surface Warfare Center; Dahlgren, Virginia

WEAPONS

Airborne

Airborne Mine Neutralization System (AMNS)

Description
The AMNS is an expendable, remotely operated mine neutralization device that leverages non-developmental integration and COTS Technologies, deploys from MH-60S helicopters, and provides identification and neutralization of proud (i.e., not buried), close-tethered, and in-volume naval mines. The MH-60S will deploy a remotely operated AMNS neutralization device to a previously detected mine location where it will reacquire and neutralize identified targets. The AMNS will be fully integrated into the MH-60S avionics architecture.

Status
Beginning in FY 2003, AMNS systems have been procured for the MH-53E to provide a near-term contingency airborne neutralization capability. Follow-on AMNS system integration into the MH-60S began in FY 2003 and will continue through a FY 2007 Milestone C decision. The AMNS on the MH-60S is scheduled for IOC in FY 2007.

Developers
Lockheed Martin; Syracuse, New York
STN Atlas; Germany
Raytheon; Portsmouth, Rhode Island

Rapid Airborne Mine Clearance System (RAMICS)

Description
The RAMICS will fire a MK-258 Mod1 30mm super-cavitating projectile from a MK-44 Bushmaster II gun to neutralize surface and near-surface mines. The RAMICS will ultimately be hosted onboard the MH-60S helicopter as one of five developing Airborne MCM (AMCM) systems organic to the strike group. At the heart of this system is a super-cavitating Tungsten projectile that is specially designed for traveling tactical distances in air and water and through a casing, causing a low-order deflagration of the mine. The gun is controlled by a fire-control system with targeting algorithms coupled with a Light Detection and Ranging (LIDAR) system. The LIDAR locates and targets the mines and provides aiming coordinates to the gun's fire control system to fire a burst of rounds at the mine, causing immediate and positive mine neutralization.

Status
The RAMICS program was re-baselined in FY 2006. Procurement of systems begins in FY 2009 with first installments in FY 2010. RAMICS IOC is scheduled for FY 2010.

Developers
Northrop Grumman; Melbourne, Florida

Subsurface, Surface, and Expeditionary

Assault Breaching System (ABS)

Description
The ABS program focuses on development of standoff weapons systems to counter mine and obstacle threats in the surf and beach zones. The program uses a "System of Systems" approach that includes development and fielding of the Coastal Battlefield Reconnaissance and Analysis (COBRA) mine/obstacle detection system; Countermine System (CMS); and counter-obstacle, precision craft navigation, lane marking, and C4I capabilities. Near-term capability is scheduled to be fielded in FY 2007 with IOC scheduled for FY 2015. Platform for the COBRA system is the VTUAV. Platforms for employment of the breaching mechanisms include naval strike and U.S. Air Force combat aircraft.

Status
The program is funded. The COBRA system achieved Milestone B for its Block I capability in FY 2006. The JDAM Assault Breaching System (JABS), which provides a near-term breaching capability against unburied mines and obstacles as a contingency capability in FY 2006, is scheduled for IOC in FY 2007.

Developers
Northrop Grumman; Melbourne, Florida

Lightweight Hybrid Torpedo (LHT)

Description
The MK-54 LHT is a modular upgrade to the lightweight torpedo inventory and is designed to counter quiet diesel-electric submarines operating in the shallow water littoral environment. LHT combines existing torpedo hardware and software from the MK-46, MK-50, and MK-48 Advanced Capability (ADCAP) programs with advanced digital COTS electronics. The resulting MK-54 LHT offers significantly improved shallow water capability at reduced life-cycle costs. While the baseline MK-54 will provide the warfighter with improved shallow water performance, the MK-54

P3I program will modernize the MK-54 by taking continuous advantage of technology advancements during the hardware acquisition process while addressing current weapon limitations and evolving threats and countermeasures. The MK-54 modernization plan will leverage the spiral acquisition process to synergistically introduce new hardware and software updates that will provide step-like increases in probability of kill while reducing life-cycle cost and allowing the torpedo to remain ahead of the evolving littoral submarine threat.

Status
Milestone II was achieved in FY 1996 along with an EMD contract award. A successful CDR was held in November 1999 with developmental testing beginning in July 1999. The LRIP contract was awarded in early FY 2000. The MK-54 program completed OPEVAL in third quarter FY 2004, and achieved IOC in fourth quarter FY 2004. Full Rate Production began in FY 2005, with a procurement of 94. The approximate total buy for the program is expected to be 1,500. The MK-54 is planned to achieve FOC in FY 2011.

Developers
Raytheon; Mukilteo, Washington

MK-15 Phalanx Close-In Weapon System (CIWS)

Description
The MK-15 Phalanx CIWS is an autonomous combat system capable of searching (Ku-band radar), detecting, tracking (radar or electro-optic), controlling, and engaging the threat with a 20mm gatling gun capable of firing 4,500 tungsten rounds per minute. An integral element of ship self-defense and the anti-war warfare defense-in-depth concept, CIWS provides terminal defense against Anti-Ship Cruise Missiles (ASCMs) and high-speed aircraft penetrating outer fleet defensive envelopes. Phalanx CIWS can operate autonomously or be integrated with the ship's combat system. The CIWS Block 1B Surface Mode configuration further provides defense against small, fast, surface craft and slow-flying helicopters and aircraft with the addition of an integrated Forward Looking Infra-Red (FLIR). All CIWS configurations in the Fleet are programmed to be upgraded to Block 1B with an estimated completion date in FY 2012. The Block 1B Baseline 2 radar upgrade was developed to address 228 obsolete material issues. This radar upgrade will provide the system with a 15 dB sensitivity improvement.

The MK-15 Mod 29 is the Land-based Phalanx Weapon System (LPWS) developed to counter rocket, artillery and mortar attacks. LPWS is basically a Phalanx CIWS mounted on a low-boy trailer configured with portable power generation and cooling systems.

The LPWS is presently deployed in Iraq defending the troops from rocket and mortar attacks.

The MK-15 Mod 31 is the Phalanx SeaRAM system. SeaRAM is a Block 1B Baseline 2 Phalanx CIAN configuration with the gatling gun replaced with an 11-round Rolling Airframe Missile (RAM) launcher guide. SeaRAM is also an autonomous (or integrateable) combat system capable of searching, detecting, tracking, controlling and engaging the threat with RAMs. SeaRAM is part of both General Dynamics and Lockheed Martin Littoral Combat Ship (LCS) configurations.

Status
More than 275 Phalanx CIWS systems are presently deployed in the U.S. Navy. The Phalanx CIWS Block 1B Baseline 2 radar upgrade and SeaRAM weapon system are presently undergoing developmental testing (DT) on the Self-Defense Test Ship (SDTS). Three SeaRAM systems are presently scheduled to be delivered to the LCS shipbuilding program through FY 2008. Acquisition of Phalanx CIWS continues in sufficient numbers to support new-construction warship delivery. In FY 2006, 39 CIWS 1Bs were procured with the remaining 120 scheduled across the FYDP (FY 2007-2012). The U.S. Army has procured a total of 22 LPWS systems for defense of their forward operating bases in Iraq and is expected to procure additional LPWS systems.

Developers
Raytheon; Tucson, Arizona

MK-48 Advanced Capability (ADCAP) Torpedo/CBASS-Common Broadband Advanced Sonar System

Description
MK-48 heavyweight torpedoes are used solely by submarines and are employed as the primary ASW and ASUW weapon in attack submarines and as the principal defensive weapon in strategic ballistic-missile submarines. Additionally, three allied countries have acquired the MK-48 torpedo. With a need to continue torpedo performance-upgrade programs to counter continuously evolving threats, the Navy developed the MK-48 ADCAP torpedo.

MK-48 ADCAP: The MK-48 Mod 5 ADCAP torpedo is the replacement for the MK-48 Mod 4 torpedo. Authorized for full production in 1990, the ADCAP counters surface-ship and submarine

threats with greater speed and accuracy than any other submarine launched torpedo in the Navy's history. It is a heavyweight acoustic-homing torpedo with sophisticated sonar, all-digital guidance and control systems, digital fusing systems, and propulsion improvements. Its digital-guidance system allows for repeated improvements to counter evolving threats through software upgrades. The last new ADCAP torpedo was delivered in 1996. To improve future performance, several upgrades are being made to the existing ADCAP inventory.

ADCAP Modification Program (MODS): The MODS program implements significant software and hardware improvements to the existing ADCAP inventory to improve ADCAP operational capability in the next torpedo generation.

MK-48 Mod 6 ADCAP: The MK-48 Mod 6 gains two significant improvents over the Mod 5 following MODS program upgrade, one in guidance and control (G&C Mod), and the other in the torpedo propulsion unit (TPU Mod). The G&C Mod improves the acoustic receiver, replaces the guidance-and control set with updated technology, increases memory, and improves processor throughput to handle the expanded software demands required to improve torpedo performance against evolving threats. The TPU Mod provides a tactically significant reduction in torpedo radiated-noise signatures.

MK-48 Mod 7 Common Broadband Advanced Sonar System (CBASS): CBASS is a significant hardware and software upgrade to the MK-48 Mod 6 torpedo. The CBASS program is a joint development program with the Royal Australian Navy. It will include a new broadband sonar system (and its associated software) to achieve significant increases in operating bandwidth. The system will also include new broadband processing algorithms that will improve CCM and shallow-water performance while retaining deep-water performance characteristics. With the standup of a Royal Australian Navy MK-48 ADCAP intermediate maintenance capability in Australia, both Navies will be ready for joint operational testing to be conducted in waters off Australia. The first CBASS in water runs were conducted in September 2004 and the MK-48 Mod 7 CBASS torpedo completed IOC in FY 2006. The MK-48 ADCAP is and will remain the Navy's primary submarine launched conventional Anti-Submarine Warfare and Anti-Surface Warfare torpedo through 2026.

Operational Software Upgrades: Software upgrades have been and will be developed and integrated into the MK-48 ADCAP. Changes in threat scenarios, such as the inclusion of littoral operating areas, the increased availability of modern countermeasures, and the proliferation of diesel submarines, are the major impetus for updating software. Performance issues, including deficiencies discovered during fleet exercises and developmental testing, also will be resolved during these updates. The MK-48 ADCAP Torpedo Spiral Development program involves improving torpedo performance through software upgrades primarily against the

shallow water diesel threat. Spiral 1 is expected to provide a 25 percent increase in torpedo effectiveness against targets in shallow water.

Status
The first phase of Spiral 1 has been completed. Full Spiral 1 developmental and operational testing will be completed in FY 2007. Spiral 2/3 development is in progress with developmental and operational testing expected in FY 2008. Spiral 4 is planned for FY 2010. The MK-48 ADCAP Mod 6 ACOT completed development testing in November 2004 and completed operational testing in November 2005 with fleet release expected in 2007. The MK-48 ADCAP Mod 7 (CBASS) is in operational testing with IOC completed in FY 2006. A total of 1,263 units are slated for conversion through the life of the program.

Developers
Raytheon Systems Corporation; Keyport, Washington

Navy Ballistic Missile Defense (BMD)

Description
Aegis BMD includes modifications to the Aegis Weapon System and the development and upgrade of the Standard Missile 3 (SM-3) with its hit-to-kill kinetic warhead. This combination gives select Aegis cruisers and destroyers the capability to intercept short and medium-range ballistic missiles in the ascent, midcourse, and descent phases of their exo-atmospheric trajectories. Additionally, Aegis BMD provides surveillance and tracking capability against long-range ballistic missile threats. Together, these capabilities contribute to robust defense-in-depth for U.S. and allied forces, vital political and military assets, population centers, and large geographic regions against the threat of ballistic missile attack. The Missile Defense Agency and the Navy deployed the Aegis BMD long-range surveillance and tracking capability as an element of the Ballistic Missile Defense System (BMDS) in October 2004. The Aegis BMD short and medium range ballistic missile engagement capability was certified for operational use in August 2006.

Status
Today, ten destroyers have the LRS&T capability, and are able to cue the greater BMDS. Additionally, three Aegis cruisers and three destroyers have both the LRS&T and an engagement capability using the SM-3 missile. These ships are available to conduct emergency active defense against short and medium-range ballistic missiles and to cue the BMDS in defense of the homeland. Five additional destroyers are planned to have these capabilities in CY 2007. In June 2006, an SM-3 fired from USS *Shiloh* (CG 67) successfully intercepted a separating ballistic missile target out-

side the earth's atmosphere. This was the seventh intercept since January 2002 The Aegis fleet plays a significant role in the nation's future BMD plans. The ongoing open architecture Combat System development affords the opportunity for an even larger contribution as our Aegis Fleet is modernized. In May 2006, USS *Lake Erie* (CG 70) successfully engaged a Short Range Ballistic Missile (SRBM) intercept using a modified Linebacker computer program and a modified SM-2 Block IV missile. MDA will install this sea-based Terminal (SBT) Ballistic Missile Defense Capability in the Aegis BMD Computer Program. A certified SBT capability will be available by 2009. This will provide an endo-atmospheric "lower tier" capability resulting in a more lethal layered defense against enemy ballistic missiles.

Developers
Lockheed Martin; Moorestown, New Jersey
Raytheon; Tucson, Arizona

RIM-7, RIM-162 NATO Sea Sparrow Missile System (NSSMS) and RIM-162 Evolved Sea Sparrow Missile (ESSM)

Description
The MK-57 NSSMS is deployed in the Aircraft Carrier (CV/CVN) and Multipurpose Amphibious Assault Ship (LHD) classes and is being installed in the newest Multipurpose Amphibious Assault Ship (LHA 6) class. The MK-57 NSSMS and its associated RIM-7 NSSM or RIM-162 ESSM serves as the primary end-to-end surface-to-surface and surface-to-air ship self-defense missile system. The MK-57 NSSMS has undergone a series of modifications, including the implementation of a COTS solution that reduces maintenance and manpower requirements, minimizes cost of ownership and integrates ESSM into the combat system increasing battlespace and firepower. The focal point of the upgrade was to increase the Operational Availability and Mean Time Between Critical Failure. Target Acquisition System (TAS), engineered to support ships in ADW, is a combined volume search radar with a control element that determines Threat Evaluation and Weapon Assignment for RIM-7 in LHD and CVN-class ships. TAS interfaces with the Advanced Combat Direction System (ACDS) and the RAM Guided Missile Launching System (GMLS).

ESSM is the next generation of Sea Sparrow missiles, replacing the RIM-7, currently deployed on the *Arleigh Burke* (DDG 51) Flight IIA Aegis destroyers. ESSM will be the premier self-defense weapon for DDG Mod, DD(X), CVN, CVN 21 and LHA 6-class ships, as well as for Aegis cruisers receiving the Cruiser Modernization. ESSM is a kinematic upgrade to the improved RIM-7P missile. It

was designed to defeat advanced highly maneuverable threats. The upgrades consist of a more powerful rocket motor, a tail control section for increased responsiveness, VLS capability, upgraded warhead, and a quick-reaction electronic upgrade. Enhanced ESSM kinematics and warhead lethality will leverage the robust RIM-7P guidance capability to provide increased operational effectiveness against high-speed maneuvering hardened anti-ship cruise missiles at greater intercept ranges than is now possible with the RIM-7P. ESSM will introduce a surface-to-surface/anti low-velocity air threat capability in 2007. Operational in 2004, ESSM is being procured as an international cooperative initiative involving ten countries in the NATO Sea Sparrow Consortium.

Status

In-service support of NATO Sea Sparrow systems is complete. ESSM successfully completed OPEVAL testing in mid-2003, reached Milestone III and achieved full-rate production in January 2004, and has an In-Service Support MOU in place. IOC occurred in FY 2004 with fleet introduction on an *Arleigh Burke* Flight IIA destroyer. ESSM Fleet introduction in CVN class ships is scheduled for FY 2008 including both AAW and improved ASUW capability.

Developers

Raytheon; Tucson, Arizona

RIM-66C SM-2 Standard Missile-2 Blocks III/IIIA/IIIB

Description

Standard Missile-2 (SM-2) is the Navy's primary area air defense weapon. Deployed SM-2 Block III/IIIA/IIIB configurations are all-weather, ship-launched, medium-range surface-to-air missiles currently in service with the U.S. Navy and seven allies. SM-2 provides a robust area air defense layer required for maintaining forward naval presence, operating in the littorals and projecting and sustaining U.S. forces in distant anti-access or area-denial environments. SM-2 Block III/IIIA/IIIB missiles are launched from the MK-41 Vertical Launching System (VLS) installed in Aegis cruisers and destroyers. It employs inertial mid-course guidance with command updates from the shipboard fire control system and an Electronic Countermeasure (ECM)-resistant mono pulse receiver for semi-active radar terminal homing. Each SM-2 block upgrade is progressively more capable and continues to evolve to provide enhancements in very high and very low altitude intercepts, stressing ECM environments, and against low altitude, supersonic maneuvering threats. Block III features improved performance against low-altitude threats and optimizes the trajectory shaping resident within command guidance from the Aegis weapons system by implementing Shaping and Fuse Altimeter engineering change improvements. Block IIIA features significantly enhanced performance and lethality against sea-skimming threats due to a new directional warhead and Moving Target Indicator (MTI) fuse design in addition to enhanced trajectory-shaping functionality.

Block IIIB builds on the Block IIIA improvements by adding an infrared (IR) guidance mode capability developed in the Missile Homing Improvement Program (MHIP) to improve performance in a stressing ECM environment. The IIIB MHIP dual-mode RF/IR guidance capability is being incorporated to counter a specific fielded and proliferating electronic warfare system in existing aircraft and cruise missile threats. Blocks IIIA/IIIB will be the heart of the SM-2 inventory for the next 15 years. The latest generation of Block IIIB missiles includes a maneuverability upgrade (SM-2 Block IIIB w/MU) to enhance IIIB performance against low-altitude, supersonic maneuvering threats.

Status

SM-2 Block III/IIIA/IIIB missiles are currently deployed. Block IIIB is the only variant in production for the U.S. Navy, although Block IIIA is still produced for Foreign Military Sales. Block IIIB MUs are being produced as new all-up rounds and as upgrades from older Block III and IIIA missiles through the Service Life Extension Program. FY 1995 was the first year of production for the SM-2 Block IIIB, which achieved IOC in FY 1997.

Developers

Raytheon; Tucson, Arizona

RIM-116A Rolling Airframe Missile (RAM)

Description

RAM is a high-firepower, low-cost system designed to engage anti-ship cruise missiles (ASCMs) in the stressing electronic counter measures (ECM) littoral conflict environment. RAM is a five-inch diameter surface-to-air missile with passive dual-mode radio frequency/infrared (RF/IR) guidance and an active-optical proximity and contact fuse. RAM has minimal shipboard control systems and does not require shipboard information after launch. Effective against a wide spectrum of existing threats, the RAM Block1 IR upgrade incorporates IR "all-the-way-homing" to improve performance against evolving passive and active ASCMs. Current plans are for RAM to continue evolving to keep pace with emerging threats.

Status

RAM is installed in *Tarawa* (LHA 1)-class amphibious assault ships; seven *Wasp* (LHD 1)-class amphibious assault ships; eight *Whidbey Island* (LSD 41)-class dock landing ships; four *Harpers Ferry* (LSD 49)-class dock landing ships, nine (CV/CVN) aircraft carriers and two *San Antonio* (LPD 17) class landing platform dock ships; RAM is also planned for installation on all remaining in commission aircraft carriers by FY 2007 as well as for all LPD 17 class ships, CVN 77, LHD 8, LHA 6 and flight 0 LCS. Block 0 missiles and launchers completed their final production run on schedule, and the missile has had successful intercepts in177 of 186 production-acceptance and ship-qualification tests. The

Block 1 missile has completed the most stressing OPEVAL ever attempted using the Self-Defense Test Ship-23 of 24 successful firings-and has completed developmental/operational testing, with IOC in FY 2000. Block 1 is currently at full-rate production. So far the program has procured 90 missiles in FY 2000, 90 in FY 2002, 106 in FY 2003, 90 in FY 2004, 90 in FY 2005, 90 in FY 2006, and an additional 630 programmed from FY 2007-2013. We are heavily invested in the development of the RAM Block 2 missile. RAM Block 2 is a kinematic upgrade to the missile for countering maneuvering threats and regaining battlespace. IOC for RAM Block 2 is scheduled for FY 2011. RAM Block 2 will eventually replace Block 1 missiles.

Developers
Raytheon; Tucson, Arizona
RAMSYS; Germany

SM-6 Extended-Range Active Missile (ERAM) Block I/II

Description
The Navy's next-generation Extended Range Air Defense Warfare (ADW) interceptor, SM-6 is a transformational surface-to-air missile. With its active-seeker technology, SM-6 will meet the anticipated theater air and missile warfare threat well into the next decade, providing an essential element of the Navy's Sea Shield vision. Introduction of active-seeker technology to Air Defense in the Surface Navy reduces Aegis Weapon System reliance on illuminators and provides improved performance against stream raids and targets employing advanced characteristics (maneuverability, low radar cross section, kinematics, and advanced electronic countermeasure features). SM-6 is a critical pillar of the Navy's Integrated Fire Control-Counter Air (NIFC-CA) capability and will provide a significant contribution to the Joint Integrated Fire Control operational architecture. The evolutionary acquisition strategy will leverage alignment of technology paths among Naval Sea Systems Command (NAVSEA), Naval Air Systems Command (NAVAIR), and the U.S. Air Force across multiple missions and missile production lines to dramatically reduce technology development, recurring production, and life cycle costs. The SM-6 ERAM acquisition strategy is characterized as a low-risk development approach which leverages the SM-2 Block IV/IVA program Non-Developmental Items and Raytheon's Advanced Medium Range Air-to-Air Missile (AMRAAM) Phase 3 active seeker program for NAVAIR. The SM-6 need is documented in the Mission Needs Statement for Joint Theater Air and Missile Defense, Theater Air and Missile Defense Capstone Requirements Document (CRD), and in the Ship Class Anti-Air Warfare Self-Defense CRD. The specific requirements are documented in the Operational Requirements Document for Standard Missile-6 (SM-6) ERAM, signed by the CNO on 1 May 2004. The SM-6 missile will be fielded on legacy DDG 51 and CG 47 class ships as well as the future CG(X) warship.

Status
Navy established the SM-6 ER Air Defense program in PB 2004, with an FY 2010 IOC. The Joint Requirements Oversight Council (JROC) approved the Operational Requirements Document 23 June 2004 following a Milestone B Defense Acquisition Board decision 15 June 2004 designating SM-6 an ACAT 1D program. SM-6 successfully completed its Design Readiness Review in 2006, ahead of schedule. Spiral development for Block II will achieve full Joint Integrated Fire Control engagement operations and could include expanded capabilities to support sea-based terminal ballistic missile defense.

Developers
Raytheon; Tucson, Arizona

UGM-133A Trident II/D5 Submarine-Launched Ballistic Missile (SLBM)

Description
The Trident II/D5 is the sixth generation of the Navy's Fleet Ballistic Missile (FBM) program, which started in 1955. The D5 is a three-stage, solid propellant, inertial-guided submarine-launched ballistic missile (SLBM) with a range greater than 4,000 nautical miles and accuracy measured in hundreds of feet. The first eight *Ohio*-class submarines were configured to carry 24 Trident I/C4 missiles SLBMs. The ninth ship, USS *Tennessee* (SSBN 734), and all later ships were armed with the Trident II/D5 missile system. Conversion of four of the C4 ships to carry the Trident II/D5 missile began in FY 2000 and will be completed in FY 2008, although all SSBNs now deploy with only the D5 missile. Trident missiles are capable of carrying W76 or W88 Multiple Independently Targeted Reentry Vehicles (MIRVs). In operation, Trident II/D5 missiles have been declared at eight MIRV warheads under the Strategic Arms Reduction Treaty (START). The Navy continues to address future deterrence requirements against weapons of mass destruction and disruption, and the Trident II/D5 will ensure that the United States has a modern, survivable strategic deterrent. Recent efforts are underway to provide some capability for existing D5 missiles to carry a conventional warhead. Known as the Conventional Trident Modification (CTM), this effort would be the first weapon capable of precisely delivering conventional munitions to high value targets world wide, with very little notice.

Status
FY 2007 funding will be dedicated to the D5 life extension program. Full missile procurement begins in FY 2008 ending in FY 2012 with a total acquisition of 108 additional missiles.

Developers
Lockheed Martin; Sunnyvale, California

Stabilized 25-mm Chain Gun

Description
This upgrades the current MK-38 25-mm chain gun with stabilization, remote operation, fire control, and EO sensor, significantly expanding the effective range of the gun and expanding its use to night time operations. The program fills the surface self-defense capability gap for ships and is designed to engage real-time asymmetric threats at close range to ships in port, at anchor, or while transiting choke points or operating in restricted waters. It provides the capability to bridge current and future targeting and weapons technology in a close range force protection environment.

Status
Originally installed as a quick fix for ships last in the line to receive CIWS BLK 1B upgrade, the fleet has subsequently requested expanding the 25-mm gun program to include all surface ships. PB 2008 budget funds 168 stabilized mounts on CGs, DDGs, and LSDs. Currently installed on 15 ships with an additional 21 ships scheduled to receive the guns by 1 October 2007.

Developers
BAE; Louisville, Kentucky
Rafael USA, Inc.; Haifa, Israel

Threat ASCM, Missile, and Aircraft Surrogates

Navy Ranges Branch (Targets)

Description
The Navy Aerial Target Program assesses foreign threats, develops targets to represent the threats, and procures targets for fleet training and weapon system test and evaluation. The current inventory includes drones that represent the following types of threats: high-altitude supersonic missiles (AQM-37), aircraft (QF-4), subsonic sea-skimming anti-ship cruise missiles (BQM-34, BQM-74), and supersonic sea-skimming cruise missiles (GQM-163A). In addition, the Navy is conducting a pre-planned product improvement on the primary subsonic aerial target, the BQM-74E. The follow-on to the BQM-74E, the BQM-74F, will be a faster, more maneuverable subsonic aerial target with increased range and endurance to challenge weapons systems and better train sailors.

Status
The GQM-163A developmental efforts were completed in May 2005 with first delivery of low-rate production assets occurring in third quarter 2005. A total of 39 production assets are currently on contract with an additional award of 10 for FY 2007. The GQM-

163A serves as a replacement for the Vandal (MQM-8G). The Navy has been working to procure MA-31 targets to meet a power-dive requirement, however, this foreign procurement has not been successful. A power dive capability is being integrated into the GQM-163 and this capability will be demonstrated in mid FY 2008. BQM-74F targets will enter the fleet in FY 2010. The Navy is also incorporating autonomous pre-planned flight profiles for the BQM-74 which would reduce the need for target control stations and enable the target to fly in areas where target control is not available. The Navy has discontinued its QF-4 program and now conducts test and evaluation events with Navy crews on U.S. Air Force ranges against QF-4s procured from the Air Force. The Navy and Air Force have formed a team to develop an AoA to determine a follow on full scale target to replace the aged QF-4.

Developers
BQM-74 E/F: Northrop Grumman; Rancho Bernardo, California
GQM-163A: Orbital Sciences; Chandler, Arizona
MA-31: Boeing Company; St. Louis, Missouri

SENSORS

Airborne

AAR-47 Missile Approach Warning System (MAWS)

Description
The AAR-47 is a passive MAWS consisting of four sensor assemblies, a central processing unit, and a control indicator. Employed on helicopters and transport aircraft across U.S. Armed Services, the AAR-47 MAWS warns of threat missile approach by detecting radiation associated with the rocket motor and automatically initiates flare expenditure. The MAWS provides attacking missile declaration and sector direction finding and is interfaced directly to the ALE-39/47 countermeasures dispenser. The fully fielded AAR-47(V)2 upgrade improved missile warning performance, added laser warning functionality, and reduced operations and support costs of legacy AAR-47 systems. AAR-47A(V)2, which is in full-rate production, adds dynamic blanking to mitigate impacts of own ship flares on missile warning performance. Without the AAR-47, helicopters and fixed-wing aircraft have no infrared missile detection capability.

Status
AAR-47A(V)2 is in full-rate production. Work has begun on an advanced two-color IR Missile Warning Sensor and laser-based countermeasure, which were demonstrated by the Tactical Aircraft Directed Infra-Red Counter-Measure (TADIRCM) Advanced Technology Demonstration (ATD) and early operational assessment. This revolutionary technology may be fielded in a fu-

ture version of AAR-47. The Navy plans to buy AAR-47A(V)2 for every new assault support aircraft in the FYDP (MV-22, UH-1Y, AH-1W, KC-130J, etc). The procurement objective for retrofit kits is 1,090.

Developers
Alliant Defense Electronic Systems; Clearwater, Florida

ALR-67(V)3 Advanced Special Receiver

Description
The ALR-67(V)3 is a Radar Warning Receiver designed to meet Navy requirements through the year 2020. It will enable Navy F/A-18E/F aircraft to detect threat radar emissions, enhancing aircrew situational awareness and aircraft survivability.

Status
The ALR-67(V)3 program successfully completed EMD phase and operational testing in 1999 and is in full-rate production. Production quantities will eventually outfit all F/A-18E/F aircraft.

Developers
Raytheon; Goleta, California

ALQ-214 Integrated Defensive Electronic Counter-Measures (IDECM)

Description
Employed on the F/A-18E/F, the ALQ-214 IDECM is used to defend the host aircraft against radar-guided Surface-to-Air Missile (SAM) systems. Either through a towed decoy or several onboard transmitters, the ALQ-214 produces complex waveform radar jamming that defeats advanced SAM systems.

Status
The ALQ-214 and ALE-50 (towed decoy) combination is currently in full-rate production. The ALE-55 Fiber Optic Towed Decoy is currently in developmental test and is scheduled to begin operational testing in FY 2007.

Developers
BAE Systems; Nashua, New Hampshire

Naval Aviation Improved Chemical, Biological, Radiological Nuclear Defense (CBRND)

Description
The Naval Aviation CBRND program is part of a joint-service effort to provide the warfighter with the means to sustain flight operations during the threat or use of Chemical and Biological (CB) weapons of mass destruction. Naval Aviation is the lead service for the Joint Protective Aircrew Ensemble (JPACE) chemical/biological protective flight suit, which provides protection from CB warfare agents. Naval Aviation is also participating in the development of the Joint Service Aircrew Mask (JSAM), which provides head-eye-respiratory CB protection. Furthermore, Naval Aviation is participating in several joint CBRND developmental and acquisition programs that will provide the capability for in-flight automated point and standoff detection of chemical agents, as well as fielding solutions and applicators to restore aviation assets by thorough decontamination of aircrew personnel, aircraft, and sensitive equipment.

Status
JPACE IOC is scheduled for second quarter FY 2007 and will complete in first quarter FY 2013. The JSAM formal Request for Proposal for the initial fixed-wing and helicopter variants was released in September 2005. Source selection is completed. JSAM IOC is scheduled for first quarter FY 2008.

Developers
Creative Apparel (JPACE production); Belfast, Maine
Gentex (JSAM development); Rancho Cucamonga, California

Small Tactical Un-Manned Air System (STUAS)

Description
The STUAS is a joint USN/USMC, Air Force, SOCOM program to design and deliver a small organic Un-Manned Air System (UAS) for Intelligence, Surveillance, and Reconnaissance (ISR), Communication Relay, and overall battle space awareness. The genesis is a result of the PR-07 ISPP analysis of ISR support for the Global War on Terrorism and from the CONPLAN 7500 assessment. STUAS will utilize a common Ground Control Station (GCS) that will integrate with the Navy Tactical Control System (TCS), as well as the Army one ground control system that will be utilized by the U.S. Marine Corps. STUAS will utilize a modular plug-and-play payload capability to allow for timely changes in vehicle configuration. Each STUAS unit will consist of 3 air vehicles, three payloads, one ground control station and launch/recovery gear. STUAS fills the gap between the large Predator/Globalhawk UAS and the man portable/back-pack size UAS. The

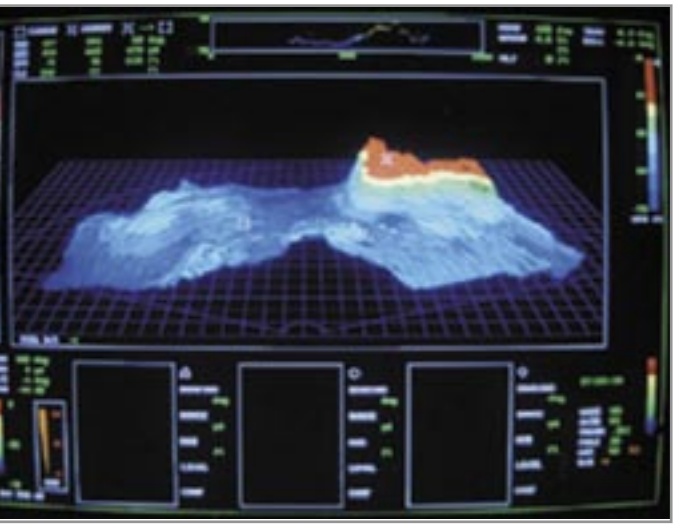
current cost for a 300 hour contract is $8 million with an upcoming anticipated expenditure for the Navy/Marine Corps of nearly $50 million (OMN).

Status
POM 2008 funding has been identified for STUAS which will ensure that the Navy will be able to meet the necessary Milestone B requirements for an FY 2010 IOC. The STUAS ICD has been briefed to the Joint Capabilities Board and has been forwarded and recommended for JROC approval. The CDD is in work and should be ready for comment by mid-year FY 2007. A formal AoA is underway and will be complete by June 2007.

Developers
Boeing; Chicago, Illinois

Subsurface

BQQ-10 Acoustic Rapid COTS Insertion (ARCI)



Description
ARCI is a three-phase program that replaces existing legacy submarine sonar systems, including BQQ-5 (SSN 688), BSY-1 (SSN 688I), BSY-2 (SSN 21), and BQQ-6 (SSBN 726) sonar, with a more capable and flexible COTS-based Open Systems Architecture (OSA), and provides the submarine force with a common sonar system. It allows development and use of complex algorithms that were previously well beyond the capability of legacy processors. The use of COTS/OSA technologies and systems will enable frequent periodic updates to both software and hardware with little or no impact on submarine scheduling. COTS-based processors allow computer power growth at a rate commensurate with commercial industry. A key facet of the sonar ARCI program (now designated BQQ-10) includes the Submarine Precision Underwater Mapping and Navigation (PUMA) upgrade. This consists of software processing improvements delivered as part of Advanced Processor Build (APB) 02, to the BQQ-10 High Frequency (HF, ARCI Phase IV) and BQS-15 EC-19/20 sonar systems. This enhancement provides submarines with the capability to map the ocean floor and register geographic features, including mine-like detections, and display the map in a 3-D representation. This capability to precisely map the ocean floor allows submarines to conduct covert battlespace preparation of the sea bottom as well as survey and avoid minefields with impunity. These digital maps can be compressed and transmitted to other naval forces for display on sea-based and land-based platforms. Additionally, the open architecture design of the ARCI system allows for the rapid insertion of new sensor systems and processing techniques at minimal cost. New sensor systems, such as the low cost conformal array, large vertical array, and advanced towed arrays currently in develop-

ment, will be incorporated in the ARCI system through annual advanced processor build (APB) software improvements and biannual technical insertions of improved processing power.

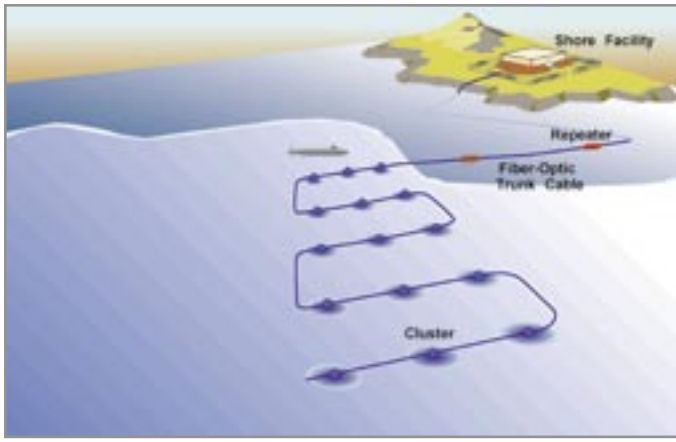
Status

ARCI Phase II (FY 1999) provided substantial towed and hull array software and hardware processing upgrades that significantly improved LF detection capability. Phase III (FY 2001) augments the current Spherical Array DIMUS beam-former with a linear beam-former and enhanced processing that improves MF detection capability. Phase IV (FY 2001) upgrades the HF sonar on improved *Los Angeles* (SSN 688I)-class submarines. Each phase installs improved processing and workstations (point click trackballs, Windows environment). Recent, real world encounters have consistently demonstrated the overwhelming success of this program to restore U.S. acoustic superiority. ARCI completed OPEVAL in FY 2003. The BQQ-10 sonar system is being installed on all submarines as rapidly as possible given the available funding. Continuous improvements via the technical insertion process (every two years) and advanced processor builds (every year) add additional processing and function capability to the system. These improvements include additional towed array processing in support of fleet operations, accelerated delivery of organic mine countermeasures capability inherent in ARCI Phase IV, and adding automation and bell ringer features. Navy research, development, testing, and evaluation will continue to develop processing algorithms from the surveillance, tactical and advanced R&D communities as well as perform laboratory and at-sea testing.

Developers

Lockheed Martin; Manassas, Virginia
General Dynamics Advanced Information Systems; Fairfax, Virginia
Advanced Research Laboratory, University of Texas at Austin; Austin, Texas

Fixed Distributed System Commercial Off-The-Shelf (FDS-C)



Description

FDS-C is a COTS version of the long-term, passive acoustic fixed surveillance FDS system. FDS-C provides threat location information to tactical forces and contributes to an accurate maritime picture for the Joint Force Commander. Due to its strategic positioning and long lifetime, it provides indication and warning of hostile maritime activity before conflicts begin. Both FDS and FDS-C comprise a series of arrays deployed on the ocean floor in deep-ocean areas, across straits and other chokepoints, or in strategic shallow water littoral areas. The system is made up of two segments: the Shore Signal and Information Processing Segment

(SSIPS), which handles the processing, display, and communication functions, and the Underwater Segment, which consists of a large area distributed field of acoustic arrays. FDS-C was developed as a less-expensive follow-on version of FDS by converting to COTS equipment. Taking advantage of advances made in the commercial industry provides a much more cost-effective FDS-caliber system to meet the fleet's ongoing needs for long-term undersea surveillance. Additionally, the program is pursuing the development of other technologies, such as an all fiber-optic hydrophone passive array, to further increase system reliability and performance at reduced cost.

Status
FDS and FDS-C processing are being upgraded with the Integrated Common Processor (ICP). That will result in increased operator proficiency, increased functionality and savings in logistics support and software maintenance.

Developers
To be determined.

TB-29A Submarine Thin-Line Towed Array

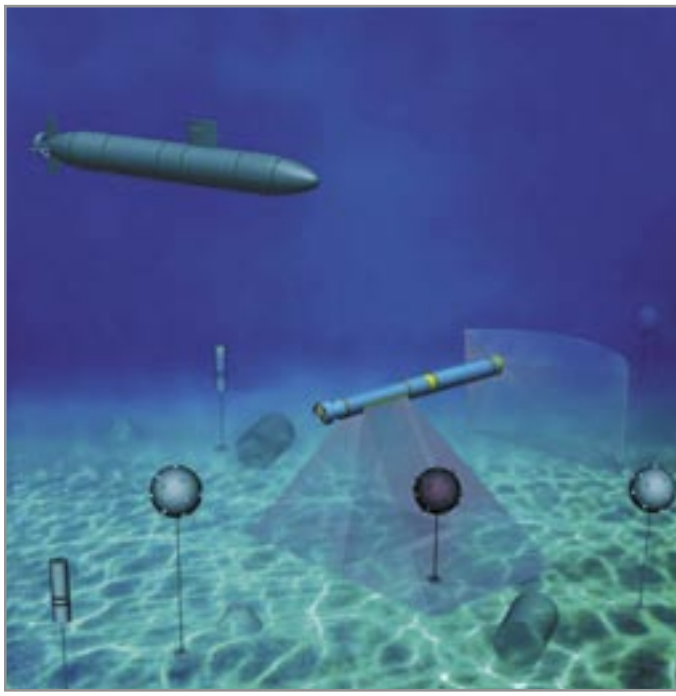
Description
The TB-29A submarine thin-line towed array is a COTS version of the legacy TB-29 towed array. These arrays will be used for backfit on USS *Los Angeles* (SSN 688 & SSN 688I) and USS *Seawolf* (SSN 21)-class submarines and will be forward-fit on the USS *Virginia* (SSN 774)-class submarine. TB-29A will also be used for the SURTASS twin-line towed array system. It will provide greater capability than the current TB-23 thin-line towed arrays and achieve enhanced supportability through commonality. The TB-29A uses COTS telemetry to reduce significantly unit cost while maintaining superior array performance. These arrays were tested on the SURTASS ships and began supporting the IUSS community in FY 2005. Coupled with the submarine ARCI system, TB-29A arrays provide the same 400-500 percent increase in detection capability against quiet submerged platforms in blue water and shallow water areas, as the current TB-29 has demonstrated.

Status
TECHEVAL and OPEVAL results show the TB-29A performance as superior to the TB-29, giving the *Virginia*-class and the ARCI equipped SSNs a better performing tactical towed array. OPEVAL was conducted during second quarter FY 2003. A total of 11 arrays have been procured and delivered under LRIP I & II. Twelve arrays were procured under LRIP III with deliveries starting in FY 2004. Procurement rates to date have been based upon the availability of limited funding. As a result, in FY 2003 the program sponsor determined that there were insufficient funds to support production

and procurement of TB-29A arrays beyond FY 2004. These shortfalls in funding, coupled with changes in fleet requirements, led to the recommendation to cancel the program. Therefore, during the first quarter of FY 2004 the MDA granted permission to close-out this ACAT Level III program with a final LRIP buy consisting of nine additional arrays. The delivery of the last TB-29A arrays will be in FY 2005. The total procurement of TB-29A arrays upon completion and delivery of the final LRIP buy will be 32.

Developers
Lockheed Martin; Syracuse, New York
L3 Communications; Sylmar, California

Unmanned Undersea Vehicles (UUV)



Description
Several acquisition programs are ongoing within the Navy to field UUV systems to improve current Navy Sea Shield capabilities in enabling assured access. The 2004 Navy UUV Master Plan prioritizes UUV missions to support *Sea Power 21*, and maps intended missions to four distinct vehicle classes (by size). The three highest priority UUV missions—ISR, MCM, and ASW—are the focus of current R&D efforts.

The Long-Term Mine Reconnaissance System (LMRS) is an engineering development vehicles that provides several technologies key to developing a capability to conduct clandestine minefield reconnaissance. In 2005, two LMRS vehicles proved clandestine launch and recovery, autonomous operation, and provided critical battery technology and integration development to enable up to 40 hours of endurance.

The Mission Reconfigurable UUV (MRUUV)—under development—will provide a robust capability to conduct clandestine minefield reconnaissance and Intelligence, Surveillance, and Reconnaissance (electro-magnetic and electro-optical ISR, and Indications and Warning). The MRUUV will include unique capabilities, such as submarine launch and recovery and autonomous operation endurance of more than 40 hours. Sensor and system enhancements are being pursued to expand capabilities in the areas of Precision Underwater Mapping and Navigation, Synthetic Aperture Sonar, Acoustic Communications, and high density renewable energy sources. The 21-inch MRUUV will be of similar size and shape as LMRS and will build upon the LMRS design features. MRUUV represents an enhanced capability by providing reconfigurable sensor packages for potential missions such as undersea search and survey, communications and navigation aids and monitoring for weapons of mass destruction. A Large Displacement MRUUV will be developed as a follow-on to the 21-inch MRUUV and will bring enhancements in endurance and sensor packages.

Status
Since inception, EOD and NSCT-1 UUV programs have been on accelerated schedules. NSCT-1 and EOD UUV interim systems have been fielded and engaged in real world operations. During Operation Iraqi Freedom, NSCT-1 UUVs were deployed in the port of Umm Qasr operating in strong currents and low visibility and validated their operational value to fleet operations. EOD UUVs were used to support Space Shuttle Columbia underwater search and recovery operations and, recently, Hurricane Katrina recovery operations. The use of these UUVs reduced the tactical timeline, minimized risk to man-in-the-minefield systems and improved overall mission effectiveness. The final NSCT-1 S-C-M UUV system prototype evaluation is complete and a production decision was reached in July 2005. IOC for the NSCT-1 S-C-M UUV system will occurred in FY 2006. The NSCT-1 Reacquire and ID UUV program component will reach IOC in FY 2009, with the Neutralization UUV component reaching a production decision in FY 2012. The neutralization component will provide a low-cost mine neutralization capability to the fleet, NSCT-1, and EOD operators. The LMRS completed detail design in August 1999 and is in the EMD Phase. Submarine launch and recovery test is scheduled for completion in April 2007. The 21-inch MRUUV ORD is under review at the joint staff level, with a Milestone B decision expected by 2008. The SAHRV program recently completed OPEVAL. The FY 2007 request includes funding for development of 21-inch MRUUV.

Developers
LMRS: Boeing; Anaheim, California
SAHRV: Woods Hole Oceanographic Institution
NSCT-1:Bluefin Robotics and Hydroid
EOD: Lockheed Martin, Perry Technologies, Bluefin Robotics

Other Manufacturers: SMCM: Hydroid

Surface, Subsurface, and Expeditionary

Air & Missile Defense Radar (A&MD RADAR) Next-Generation Maritime Air & Missile Defense, Multi-Function Advanced Active Phased-Array Radar

Description
The A&MD RADAR advanced radar system is being developed as the primary air and missile defense radar for the Navy's next generation cruiser, CG(X). It is a multi-function, active phased array radar capable of search, detection, tracking of airborne and ballistic missile targets, and missile engagement support. The advanced functions of this radar include multi-mission performance in a stressing environment that will enable simultaneous defense from all Theater Air and Missile Defense (TAMD) threats. The multi-

mission capability will be effective in both air dominance of the battle space (Area Air Warfare) and in defense against ballistic missiles.

Status
The A&MD RADAR is being developed as a competitive program, with requirements definition underway this year, along with several risk-reduction projects to mature technologies for this advanced radar. The design and development after competitor down-select will lead to EDM development, testing, and production to support the IOC for CG(X).

Developers
To be determined.

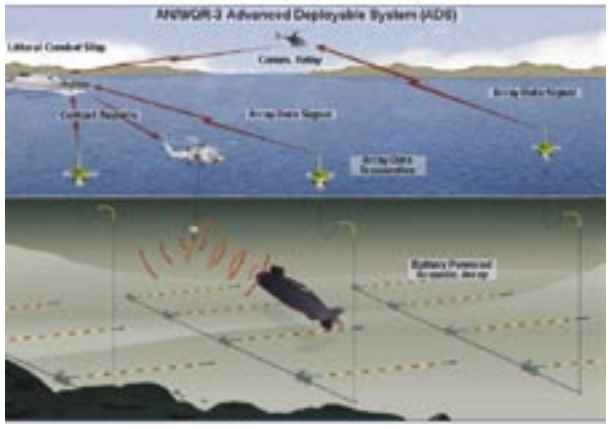
Airborne Laser Mine Detection System (ALMDS)

Description
The ALMDS is an organic, high-area coverage, electro-optic Airborne Mine Countermeasures (AMCM) laser system that detects, classifies, and localizes floating and near-surface moored sea mines. Deployed from the MH-60S helicopter, ALMDS will satisfy the Navy's need for a quick-response, wide-area, organic MCM system that can rapidly detect and classify mine-like contacts for subsequent prosecution. This capability will be critical in littoral zones, confined straits, choke points, operating areas, and Amphibious Objective Areas. ALMDS offers a much greater area search rate than other types of AMCM equipment, and it represents a capability that does not exist in the current inventory.

Status
A competitive contract was awarded in April 2000 for development of an integrated ALMDS system for the MH-60S. Milestone C and LRIP I occurred in FY 2005. The IOC is scheduled for FY 2009.

Developers
Northrop Grumman; Melbourne, Florida

AQS-20A Mine-Hunting Sonar

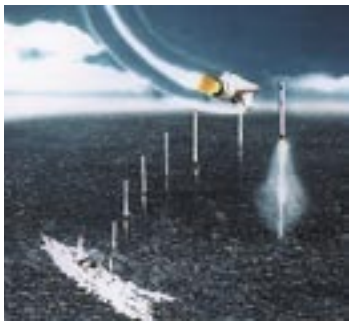


Description
The AQS-20A is an underwater mine-detection sonar that also employs an Electro-Optic Identification (EOID) sensor capable of locating and identifying bottom, close-tethered, and moored sea mines. The AQS-20A mine-hunting system will be deployed and operated from the MH-60S helicopter as one of five organic Airborne Mine Countermeasures (AMCM) weapon systems

resident in carrier/expeditionary strike groups onboard the Littoral Combat Ship (LCS). The AQS-20A system will also serve as the mine sensor subsystem of the Remote Mine Hunting System (RMS) hosted onboard Navy surface warships. The operational RMS system will be installed in the *Arleigh Burke* (DDG 51) Flight IIA Aegis guided missile destroyers beginning with DDG 91.

Status
Milestone C and LRIP I occurred in FY 2005. IOC is scheduled for FY 2007. Improvements to Computer Aided Detection/Computer Aided Classification and Environmental Data Collection capabilities are being implemented via enhanced research and development efforts.

Developers
Raytheon; Portsmouth, Rhode Island



Nulka Radar Decoy System

Description
Nulka is an active, off-board, ship-launched decoy developed in cooperation with Australia to counter a wide spectrum of present and future radar-guided anti-ship cruise missiles. The Nulka decoy employs a broadband radio frequency repeater mounted atop a hovering rocket platform. After launch, the Nulka decoy radiates a large, ship-like radar cross-section flying a trajectory that seduces and decoys incoming ASCMs away from their intended targets. Australia developed the hovering rocket, launcher, and launcher interface unit. The U.S. Navy developed the electronic payload and fire control system. The existing MK-36 Decoy Launching System (DLS) has been modified to support Nulka decoys, resulting in the MK-53 DLS.

Status
Nulka received Milestone III approval for full-rate production in January 1999. Installation began on U.S. and Australian warships in September 1999. Operational testing in 2006 was successful and the system was installed on 88 U.S. Navy ships. The remaining installations will be completed by early 2009.

Developers
BAE Systems; Edinburgh, Australia
SECHAN Electronics Inc.; Lititz, Pennsylvania
Lockheed Martin Sippican; Marion, Massachusetts

Organic Airborne and Surface Influence Sweep (OASIS)

Description
The OASIS system will provide the strike group with an organic, high-speed, magnetic/acoustic influence minesweeping capability to effectively neutralize sea mine threats in operating areas where mine hunting is not possible due to mine burial or high bottom clutter. The OASIS system is one of five Airborne Mine Countermeasures (AMCM) systems under development that will be deployed and operated from the MH-60S helicopter.

Status
Milestone C and LRIP I are scheduled for FY 2007. IOC is scheduled for 2008.

Developers
EDO Corporation; New York, New York

S-Band Volume Search Radar (VSR)

Description
The Volume Search Radar (VSR) is an S-band active phased array radar designed to meet all above-horizon detection and tracking requirements for 21st Century ships without area air-defense missions, specifically the DDG 1000 and CVN 78 classes. VSR will provide long range situational awareness with above-horizon detection and air control (marshalling) functionality, replacing the functionality of today's SPS-48E and SPS-49 radars. A non-rotating phased array, VSR provides the required track revisit times to deal with fast, low/small, and high-diving missile threats, providing cueing for the SPY-3 Multi-Function Radar (MFR) to conduct required tracking and fire control functions above the horizon.

Status
An Engineering and Manufacturing Development array was completed in 2006 and is undergoing string testing in preparation for development testing at the land-based test site in 2007. VSR development, testing and production schedules are aligned with DDG 1000 and CVN 78 shipbuilding schedules. VSR will be fielded as an integrated radar with the SPY-3 MFR, together referred to as the Dual-Band Radar (DBR). OPEVAL will occur with DDG 1000 testing. IOC for the DBR is scheduled for 2013.

Developers
Raytheon Electronic Systems (Prime); Sudbury, Massachusetts
Lockheed-Martin Maritime Sensors & Systems (Subcontractor to Raytheon-VSR Antenna System); Moorestown, New Jersey

SPQ-9B Anti-Ship Cruise Missile (ASCM) Radar

Description
The SPQ-9B is a slotted, phased-array, rotating radar that significantly improves the ability of ships to detect and track low-altitude ASCM in a heavy clutter environment. Its high-resolution track-while-scan, X-band, pulse-Doppler radar enables detection and establishment of a firm track at ranges allowing the combat system to engage subsonic or supersonic sea-skimming missiles at the outer edge of a ship's engagement envelope. SPQ-9B integrates with SSDS MK-2 on aircraft carriers and amphibious assault ships, enabling ASCM defense capabilities to pace the evolving world wide threat. The SPQ-9B is an integral part of the Cruiser Modernization program, providing an ASCM cue to the Aegis Combat System.

Status
The SPQ-9B is being fielded in conjunction with SSDS MK-2 and CG Modernization.

Developers
Northrop Grumman; Melville, New York

Shipboard Protection System (SPS)

Description
SPS is designed to augment current Naval Force Protection Tactics and Doctrine by providing a means to detect, classify, and engage real-time surface threats at close-range to ships in port, at anchor, and while transiting choke points or operating in restricted waters. The system will integrate COTS technology to provide 360° Situational Awareness and will bridge current and future technology by integrating current Force Protection initiatives with combat system technologies. A prototype system installed in the USS *Ramage* (DDG 61) employed COTS-based products interfaced with the ship's existing navigation radar and its key components included electro-optical/infra-red devices (EO/IR), an integrated surveillance system, spotlights, acoustic hailing devices, and remotely operated stabilized small arms mounts (ROSAM). Ramage provided valuable integration and component reliability feedback, lessons learned, and integrated logistics support information which provided the functional demonstration of SPS capability and helped define the formal requirements for SPS.

Status
SPS was approved at Milestone B for system design and development in January 2005. The Capabilities Development Document was approved in January 2005. SPS Block 0, Acoustic Hailing Device (AHD) fielding, is underway. Block 1 installations will commence in FY 2007 and will field the C2 core and EO/IR sensing

system. Block 2 will provide Block 1 capability and integrate MK-49 Mod 0 ROSAM in FY 2007 and early FY 2008. Block 3 will field in FY 2008 and will represent the full realization of SPS capability.

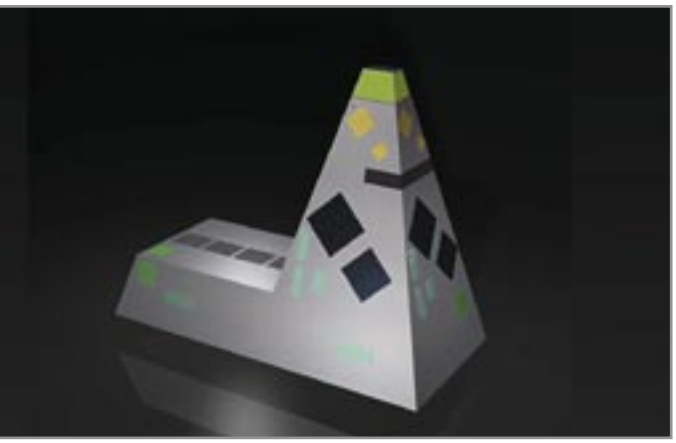
Developers
Naval Surface Warfare Centers; Dahlgren, Virginia; Crane, Indiana
FLIR Systems, Inc.; Wilsonville, Oregon
IML Corp.; Marietta, Georgia
General Dynamics Armament and Technical Products; Charlotte, North Carolina

SPY-1 Aegis Multi-function Phased-Array Radar

Description
The SPY-1 S-Band radar system is the primary air and surface radar for the Aegis Combat System installed in the *Ticonderoga* (CG 47) and *Arleigh Burke* (DDG 51)-class warships. It is a multifunctional, passive phased-array radar capable of search, automatic detection, transition to track, tracking of air and surface targets, and missile engagement support. The fifth variant of this radar, SPY-1D (V), improves the radar's capability against low-altitude, reduced radar cross-section targets in heavy clutter environments, and in the presence of intense electronic countermeasures. The SPY-1 Series radars are also used to detect, track, and engage theater ballistic missiles on select Aegis cruisers and destroyers.

Status
The SPY-1D (V) littoral radar upgrade supersedes the SPY-1D in new-construction Flight IIA destroyers that began in FY 1998. Operational testing and evaluation was completed in the fall 2005. SPY-1D (V) is installed in DDGs 91 through 107 and programmed for installation in DDGs 108 through 112. A new Multi-Mission Signal Processor (MMSP) is funded and will deliver SPY-1D(V) capability to all SPY-1D DDG's. MMSP will be fielded through DDG Modernization.

Developers
Lockheed Martin; Moorestown, New Jersey
Raytheon; Sudbury, Massachusetts



SPY-3 Multi-Function Radar (MFR)

Description
The SPY-3 MFR is an X-band active phased-array radar designed to meet all horizon search and fire control requirements for the 21st Century Fleet. MFR is designed to detect the most advanced low-observable Anti-Ship Cruise Missile (ASCM) threats and support fire-control illumination requirements for the Evolved Sea Sparrow Missile (ESSM), the Standard Missile II (SM-2) and future missiles. The MFR also supports the new ship-design requirement for reduced radar cross-section, significantly reduced manning (no operators), and total ownership cost reduction. The MFR is planned for introduction in DDG 1000 and the next-generation CVN 78 Class aircraft carriers.

Status
Two Engineering and Manufacturing Development (EDM) radar arrays were built and tested at Wallops Island land-based testing facility, with at-sea development testing on board the self-defense test ship conducted in the summer of 2006. Production of the MFR is planned to support equipment delivery schedules for DDG 1000 and CVN 78 Class ships. The MFR will be fielded as integrated radar with the S-Band Volume Search Radar (VSR), together referred to as the Dual-Band Radar (DBR). OPEVAL will occur with DDG 1000 testing. IOC for the DBR is scheduled for 2013.

Developers
Raytheon Electronic Systems; Sudbury, Massachusetts

SQQ-89 Anti-Submarine Warfare (ASW) Combat System

Description
The SQQ-89 ASW combat system suite provides USS *Oliver Hazard Perry* (FFG 7), USS *Ticonderoga* (CG 47), and USS *Arleigh Burke* (DDG 51)-class surface warships with an integrated undersea warfare detection, classification, display, and targeting capability. The system combines and processes all sonar information, and processes and displays all SH-60B Light Airborne Multi-Purpose System (LAMPS) MK-III sensor data. The current system comprises the following subsystems:

- SQS-53C/D active/passive hull-mounted sonar (SQS-56 in FFGs)
- SQR-19 Tactical Towed Array System (TACTAS)
- MK-116 ASW fire control system
- SQQ-28 sonobuoy processor

• SRQ-4 SH-60B helicopter data link

• UYQ-25B Sonar In-situ Mode Assessment System (SIMAS)

• USQ-132 Tactical Display Support System (TDSS)

• SQQ-89(T) Onboard Trainer (OBT)

The analog receivers of the SQS-53A/B hull-mounted sonar are being upgraded to digital receivers by the use of COTS processors, and are re-designated SQS-53D. Planned improvements to the SQQ-89(V) include:

• MH-60R integration

• SRQ-4 Data Link Upgrade

• Multi-Function Towed Array (MFTA) that will provide low and mid-frequency bi/multi-static receiver capability between the SQS-53C, the MH-60R Airborne Low-Frequency Active Sonar (ALFS), and off-board systems

• Remote Mine-Hunting System (RMS) processing and display

• Echo Tracker Classifier (ETC) active classification capability

• SIMAS upgrade to updated performance prediction models

• Computer-Aided Dead-Reckoning Table (CADRT)

• Torpedo Recognition and Alertment Functional Segment (TRAFS)

Status

The AN/SQQ-89 (V)15 EC/200/204 and A(V)15 is the COTS Open Architecture (OA) implementation of the required modernization of legacy ASW systems. It improves the warfighting capabilities in the shallow water littoral warfare environment. DDG new construction, DDGs 103 to 112, will have AN/SQQ-89 (V)15EC200/204 installed. The DDG modernization program upgrades DDG 51 to 78 with AN/SQQ-89A (V)15 and will deliver the first two systems in FY 2012 then three per year until complete. The FY 2007 DDG mod congressional add accelerates the purchase of two AN/SQQ 89A (V)15 systems in FY 2007 for install in FY 2009/FY 2010. The AN/SQQ89A (V)15 back fit program upgrades legacy systems on DDG 79 to DDG 90, and completes the OA migration on DDG 91 to 102. The CG modernization program upgrades the CG 59 to 73 to AN/SQQ-89A (V)15 with the first install in FY 2011. The SQQ-89A (V)15 IOC is FY 2009 and FOC in FY 2014. As a near term adjunct capability, 22 Scaled Improved Performance Sonar (SIPS) systems were purchased and installed on PAC fleet DDGs and CGs.

Developers

Lockheed Martin; Syracuse, New York
Advanced Acoustic Concepts; Hauppauge, New York

Ship-Self Defense System (SSDS)

Description
SSDS provides an integrated combat direction system for aircraft carriers and amphibious ships, enabling them to keep pace with evolving anti-ship cruise missile (ASCM) threats. Adopting an open architecture system, SSDS integrates detection and engagement elements of the combat system with automated weapons control doctrine, Cooperative Engagement Capability (CEC), and tactical data links for enhanced battle space awareness. SSDS provides a robust self-defense capability in support of Sea Shield.

Status
SSDS MK-1 began full-rate production following operational testing in 1997 and is currently fielded in all LSD 41/49 class ships. SSDS MK-2 (which provides strike group interoperability via CEC and TADIL J) achieved IOC in 2005 and continues Fleet installation. Navy plans to periodically upgrade SSDS via COTS Tech Insertion and Preplanned Product Improvement (P3I). SSDS MK-2, programmed for aircraft carriers, LHD 7 and 8, LHA 6 and *San Antonio* (LPD 17) class ships has completed design and is continuing with follow-on at-sea testing. With a federated, technically decoupled architecture, SSDS MK-2 begins initial installation in FY 2008 in USS *Nimitz* and completes fielding by 2015.

Developers
Raytheon; San Diego, California
Technical support: Johns Hopkins University Applied Physics Laboratory; Laurel, Maryland
Naval Surface Warfare Centers; Port Hueneme, California
Naval Surface Warfare Centers; Dahlgren and Dam Neck, Virginia

Surface Electronic Warfare Improvement Program (SEWIP) Block 1 Upgrade

Description
SEWIP is a spiral development block upgrade program for the SLQ-32 Electronic Warfare (EW) system, which is installed on all Q70 in Block IA combatants and auxiliaries in the U.S. Navy, with total fleet wide population of 170 systems. Block 1A replaces the processor with Electronic Surveillance Enhancement (ESE) and display console with UYQ-70. The ESE and UYQ-70 are integrated with Improved Control and Display (ICAD) software. Block 1A also improves Human Machine Interface of the SLQ-32. Block 1B adds Specific Emitter Identification (SEI) capability which offers extremely accurate platform identification; it will be

deployed initially as a stand-alone AN/SSX-1 system (Block1B1) pending integration of SEI with other capabilities (Block1B2). High Gain High Sensitivity (HGHS) receiver functionality (Block 1B3) provides improved situational awareness through non-co-operative detection and ID of airborne platforms, beyond radar horizon and overland passive surveillance supporting all mission areas, and provides extended Nulka queuing ranges. Additional improvements (e.g., initial Network-Centric Warfare Electronic Support (NCWES) interfaces) and upgraded software and displays provide integration of capabilities. Block 1C will incorporate Block 1A and 1B upgrades for active ships (CVN, CG, LHD, LHA, DDG 68-83) and two-way connectivity to Global Command Control System-Maritime netting all Electronic Warfare assets, both local and national.

Status

SEWIP was established as an ACAT II program in July 2002 as a replacement of the cancelled Advanced Integrated Electronic Warfare System (AIEWS). Acquisition Decision Memorandum (ADM) of 13 August 2002 authorized the SEWIP to proceed with Block 1A and initiate development of Blocks 1B and 1C. Block1A Stand-Alone ESE reached at Milestone C/LRIP decision on 31 January 2005. Block 1A achieved full-rate production in August 2006. Block 1B1, the AN/SSX-1, has been authorized as a Rapid Deployment Capability (RDC) for fielding stand-alone SEI capability. Development efforts of Blocks 1B2 and 1B3 are progressing toward FY 2010 TECHEVAL/OPEVAL.

Developers

Northrop Grumman PRB Systems; Goleta, California
Lockheed Martin; Eagan, Minnesota
General Dynamics Advanced Information Systems; Fairfax, Virginia

Surface Ship Torpedo Defense (SSTD)

Description

The SSTD project consists of the AN/WSQ-11 Torpedo Defense System, the SLQ-25A Nixie towed torpedo countermeasure, and expendable acoustic decoys. The purpose of these systems is to provide torpedo protection for all major surface ship types including aircraft carriers, surface combatants, logistics ships, and Military Sealift Command ships. The AN/WSQ-11 Torpedo Defense System includes the functionality of the Nixie system as well as a towed Detection, Classification, and Localization (DCL) subsystem, and a hard kill Anti-Torpedo Torpedo (ATT). The DCL component consists of a towed, active/passive sonar to include a high power transmission source and an acoustic intercept receiver. The DCL array is sized to fit on the existing Nixie handling equipment and use the same deck space and electronics cabinets. The DCL

subsystem can trigger an ATT engagement in either automatic or semi-automatic modes, manual ATT launch mode is also available. The SLQ-25A Nixie is a towed electro-acoustic countermeasure currently in Fleet service on over 150 ships. Performance and reliability upgrades have been in progress since 2004 and will continue through 2009. In addition to Nixie, over-the-side deployed Acoustic Decoys are being acquired to provide an effective and low-cost near term solution to the torpedo defense problem.

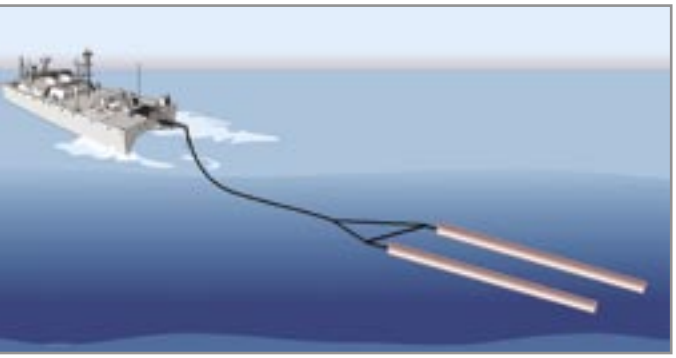
Status

The SSTD project is on track to meet the near-term objectives of concurrently developing the DCL subsystem and the ATT. Two independent DCL systems have been tested side by side at sea in FY 2006 demonstrations. These demonstrations included the firing of approximately ten torpedo test vehicles against each of the systems to evaluate their effectiveness. Initial results indicate consistent ability to detect and track threat torpedoes and salvoes of torpedoes at ranges in excess of the requirement to employ an ATT. The ATT is undergoing a series of in-water tests of the 1st Engineering Development Model (EDM-1). The testing so far has demonstrated all aspects of vehicle preset, launch, water entry, establishment of stable underwater flight and open loop (pre-programmed) maneuverability. Testing is scheduled to conclude in second quarter FY 2007 and will include closed loop homing on a moving target. The ATT effort is scheduled for a Milestone B program decision in FY 2008 and IOC in 2015. The IOC system will integrate the ATT with cruisers and destroyers to leverage the AN/SQQ-89 A(V)15 system as a detection system. Further development of the AN/WSQ-11 system and integration on large deck ships is deferred pending final DCL evaluation.

Developers

Anti-Torpedo Torpedo: Penn State Applied Research Laboratory; Pennsylvania
DCL Systems: Advanced Acoustic Concepts; Long Island, New York
Ultra Electronics; Braintree, Massachusetts

Technical Design Authority: The Naval Undersea Warfare Center; Newport, Rhode Island



UQQ-2 Surveillance Towed Array Sensor System (SURTASS)

Description

The SURTASS capability consists of a mobile fleet of five ships that employ the fleet's most capable deep and shallow water (littoral zone) passive-acoustic towed-array sonar systems. These ships provide passive detection of quiet nuclear and diesel submarines and real-time reporting of surveillance information to theater commanders and operational units. SURTASS employs either a

long-line passive-sonar acoustic array or a shorter twin-line passive-sonar acoustic array. The twin-line system is the best operational shallow water towed array and the only multi-line towed array in the Navy. It consists of a pair of arrays towed side-by- side from a SURTASS ship and offers significant advantages for undersea surveillance operations in the littoral zone. It can be towed in water as shallow as 180 feet, provides significant directional noise rejection, offers bearing ambiguity resolution without turning, allows the ship to tow at higher speed, and results in a shorter time to stabilize the array after a turn.

Status
Five SURTASS vessels are operational in the Pacific Fleet. The first production model TB-29A twin-line SURTASS array was installed in FY 2005, and all SURTASS vessels will have TB-29A twin line arrays by FY 2008. SURTASS is also being upgraded with the Integrated Common Processor (ICP) that will result in increased operator proficiency, increased functionality and savings in Logistics Support and Software Maintenance.

Developers
Lockheed Martin; Syracuse, New York
Lockheed Martin; Manassas, Virginia
BAE Systems; Manchester, New Hampshire
General Dynamics-Advanced Information Systems; Anaheim Hills, California

UQQ-2 Surveillance Towed Array Sensor System (SURTASS)/Low Frequency Active (LFA)

Description
The LFA system, the active adjunct to the SURTASS sonar system, is capable of long range detections of submarine and surface ship contacts. It comprises a low-frequency active sonar transmitter deployed below a SURTASS ship, with the SURTASS passive towed array acting as the receiver. Other Navy ships with towed arrays and compatible processing systems can also process the LFA signal returns in what is known as a "bi-static" mode. As a mobile system, SURTASS/LFA can be employed as a force-protection sensor wherever the force commander directs, including forward operating areas or in support of battle group activities. A UHF SATCOM communication system provides direct voice and data connectivity between the SURTASS/LFA ship and tactical platforms. Two LFA systems exist, installed onboard USNS *Impeccable* (T-23) and the leased R/V *Cory Chouest*. Development continues for the Compact LFA (CLFA) system employing smaller, lighter sources, enabling installation on smaller SURTASS vessels.

Status
SURTASS LFA was successfully reintroduced to the Fleet in January 2003 following a five year hiatus for completion of the En-

vironmental Impact Statement (EIS) process. In October 2003 a Federal District Court enjoined testing and training with LFA for violation of the procedural requirements of the Marine Mammal Protection Act, Endangered Species Act, and National Environmental Policy Act, notwithstanding the court's finding that a national security need existed for employment of LFA and commended the Navy for the breadth of scientific research supporting the EIS. Subject to this injunction, LFA may conduct operations in certain areas within the Philippine Sea, East China Sea, South China Sea, and the Sea of Japan. The Navy released a Draft Supplemental Environmental Impact Statement (DSEIS) in the first quarter of FY 2006. This DSEIS addressed legislative changes to the Marine Mammal Protection Act and pertinent deficiencies raised by the District Court. Currently the program consists of the USNS *Impeccable* (T-23) and one leased vessel, the R/V *Cory Chouest*. The R/V *Cory Chouest* will be deactivated in late FY 2008 at which time the reactivated USNS *Able* (T-AGOS 20) will become operational with the first CLFA system.

Developers
General Dynamics-Advanced Information Systems; Anaheim Hills, California
BAE Systems; Manchester, New Hampshire
Lockheed Martin Naval Electronics & Surveillance Systems; Manassas, Virginia; Syracuse, New York

Tactical Control System (TCS)

Description
TCS provides interoperability and commonality for mission planning, Command and Control (C2), and C4I interfaces for tactical and medium altitude Unmanned Aircraft Systems (UAS). TCS provides a full range of scaleable UAS capability from passive receipt of air vehicle and payload data to full air vehicle and payload C2. TCS offers the warfighter a common core operating environment to receive, process, and disseminate UAS data from two or more different UAS types for reconnaissance, surveillance, and combat assessment. In conjunction with Fire Scout and Littoral Combat Ship (LCS), TCS is positioned to support Sea Shield/Sea Basing pillars and to operate within the FORCENet architecture.

Status
TCS restructure was completed in order to comply with FY 2004 congressional language. The program meets congressional direction to achieve standards-based interoperability and support Navy UAS requirements. TCS continues development of an architecture that includes the following capabilities:

- Standards based implementation
- Incorporation of NATO STANAG 4586 for interoperability

• VTUAV (Fire Scout) functionality and integration with LCS. TCS is scheduled for IOC along with Fire Scout and LCS in FY 2008

• Plug and play capability

TCS flight-testing was initiated in FY 2003 and continues in conjunction with the Fire Scout Program. TCS will be integrated, tested, and fielded in accordance with the schedules of future Navy UAS programs

Developers
System Integrator, Raytheon Systems Inc.; Falls Church, Virginia

WLD-1 Remote Minehunting System (RMS)

Description
The WLD-1 RMS consists of an unmanned vehicle with an AQS-20A Sonar to conduct minehunting operations. The RMS can be launched from the DDG 51 class destroyer and will be incorporated in the design of LCS. RMS is designed to be launched with a pre-programmed search pattern and go over the horizon to search for mines using the AQS-20A Sonar. Once the mission is completed, RMS will return to the ship and data will be downloaded for Post-Mission Analysis (PMA).

Status
Milestone C and LRIP I occurred in FY 2005. IOC is scheduled in FY 2007. First deployment of RMS is scheduled to occur in FY 2007 on DDG 91 class destroyer. Testing on LCS will be completed in FY 2008.

Developers
Lockheed Martin; Riviera Beach, Florida